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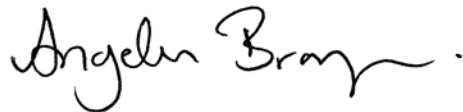
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## Declaration of Own Work

Assessment Number: J20939  
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I declare that this dissertation is my own work and that I have correctly acknowledged the work of others.

Signed:

A handwritten signature in black ink, appearing to read 'Angela Bray', followed by a period.

Date: 1<sup>ST</sup> June 2016

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## List of Abbreviations

CVD	Cardiovascular Disease
FAO	Food and Agriculture Organisation of the United Nations
GI	Glycaemic Index
G	Grams
IARC	International Agency for Research on Cancer
IFG	Impaired fasting glucose
IFPRI	International Food Policy Research Institute
Kcal	Kilocalories
Kg	Kilograms
NCDs	Non-communicable Diseases
T2DM	Type 2 Diabetes Mellitus
TUMS	Tehran University of Medical Sciences
WHO	World Health Organisation



# Part One

Review of the Literature

## **White Rice Consumption: Impact on Health in Iran**

Key Words: Nutritional transition; Iran; Non-communicable Diseases; Brown Rice

Word Count: 4904

## Abstract

The eating habits and dietary intakes of Iranians have undergone a rapid nutritional transition over the last few decades, resulting in increased consumptions of refined carbohydrates, sugars and fats. The socio-demographic, political and economic changes that occurred following the Iranian Revolution in 1979 are thought to have been the driving forces behind this nutritional transition. As eating patterns and dietary quality changed, the emergence of obesity and diet related diseases such as diabetes and cardiovascular diseases have risen. White rice is consumed as a daily staple in Iran however; habitual consumption of white rice has been associated with higher risk of diabetes, metabolic syndrome and cardiovascular disease. An unhealthy diet is known as one of the major modifiable risk factors for non-communicable diseases. Whole grains such as brown rice have been found to have health benefits that may reduce the risk of non-communicable diseases. Therefore, a change in quality of dietary carbohydrates in Iran could potentially improve population nutrition and have an impact on reducing non-communicable diseases. However, it is unknown whether changing the current white rice staple to brown rice would be culturally acceptable in Iran. Therefore, an exploratory study to assess perceptions and willingness of Iranians to change the rice staple should be undertaken.

## 1.1 Introduction

Iran is a middle-income developing country located in the Middle East with a population of more than 79 million people (WHO, 2016). In recent decades, Iranian diets have undergone a nutritional transition resulting in an increased consumption of refined carbohydrates, fats and low fibre that are associated with an increased risk of obesity and non-communicable diseases (NCDs), (Ghassemi et al. 2002). Today, 25% of all Iranians are reported to be obese and more than 11% of the population have type 2 diabetes mellitus (T2DM) and 76% of all deaths are due to NCDs (WHO, 2016a). The socio-economic burdens of these diseases are high and escalating, which compromises Iran's economic growth and development (Ghassemi et al. 2002; Heslot, 2014). White rice is a staple food in Iran and a major source of carbohydrate and energy intake for Iranians (Kolahdouzan et al. 2013). Several studies have shown higher consumption of white rice is associated with higher risk of T2DM (Hu et al. 2012), metabolic syndrome (Bahadoran et al. 2014) and cardiovascular disease (CVD) risk factors (Izadi & Azadbakht, 2015). On the other hand, consumption of whole grains are associated with lower risk of NCDs (Jang et al. 2001). Brown rice is a whole grain, which is rich in nutrients including dietary fibre, magnesium, vitamins and phytochemicals (Hu et al. 2012). In contrast white rice, which has undergone the refining process and only contains the starchy endosperm of the grain is rich in energy but nutrient poor (Steffen et al. 2003).

This review will:-

- Provide an overview of rice as a global staple food

- Outline the driving forces behind Iran's nutritional transition and explain how the modern diet has impacted public health
- Examine the association between white rice consumption, obesity and NCDs
- Assess whether whole grain replacement in the diet would be useful in order to decrease obesity and NCD risk factors

## 1.2 Rice as a staple food

Rice (*Oryza sativa*) has been a traditional staple food in Asia for centuries (Kazemzadeh et al. 2014) and it is believed to have been first cultivated in the Yangtze River valley of southern China, 8000 years ago (Gross & Zhao, 2014). Today, it is the predominant staple for over half of the world's population including Asia, Pacific, Latin America, and Africa and is the main source of income and employment for one-fifth of the world's population (Mottaleb & Mohanty, 2015). Around 90% of global rice is grown in Asia on more than 200 million small rice farms (Figure 1.1) less than a hectare of land (Tonini & Cabrera, 2011). The top five rice producers in the world are China, India, Indonesia, Bangladesh, and Vietnam (Dawe et al. 2010). Iran is the 11<sup>th</sup> in ranking and produces over 260,000 metric tons of rice a year, however, it has to import more than 600,000 metric tons to meet domestic consumption demand from other countries such as India (Feizabadi, 2011).



Figure 1.1. An example of a small rice farm in the village of Siahboom, Isfahan, Iran

Seventy percent of all rice consumed globally is in the form of white rice also called polished or milled rice, whereas brown rice, which is also known as hulled or unpolished rice, is rarely consumed (Roy et al. 2011; Schulze et al. 2007). Brown rice is a whole grain and comprises of the entire grain seed minus the outer inedible layer called the husk, (Juliano, 1993). The whole grain seed contains three main parts; bran, germ and endosperm which are rich in dietary fibre, vitamins, minerals and phytochemicals (Juliano, 1993; Steffen et al. 2003). On the other hand, white rice is a refined grain, which has been processed to remove the bran and germ layers of the seed. It contains only the endosperm (starch), which is rich in energy but nutrient poor (Steffen et al. 2003).

#### 1.2.1 Rice refining

Advancement of milling technologies over a century ago has led to traditional staple wholegrain foods such as rice being replaced by refined grains (Slavin, 2004).

Previously, rice was minimally processed and eaten as a whole grain using a labour-intensive hand pounding process (Figure 1.2a), which removed the outer husk layer but left the rest of the grain intact (Dhankhar, 2014). Today, following harvesting, the paddy rice is dried either by open-air or mechanically, before it is taken to the mill for processing into brown or white rice (Figure 1.2b & c), using a series of mechanical processes called 'hulling' and 'milling' (Kennedy, 2002). The rice processing stages for brown and white rice are illustrated in Figure 1.3. The first process known as 'hulling' removes the outer husk layer of the grain, and the second process known as 'milling' removes the bran and germ layers by polishing it into a white grain (Kennedy, 2002).

The removal of the outer husk layer of the rice seed produces brown rice and is considered a whole grain, and further removal of the germ and bran layers produces white rice, which is considered a refined grain (Kennedy et al. 2002).

The advantages of milling technology is that it is faster, improves the yield and shelf life of the rice, yet, it decreases its nutritive value. However, white rice has become more popular as it is seen as being more modern and superior to brown rice in taste and quality (Chandramouli, 2001).



(a) Hand Pounding



(b) Hulling (De-husking)



(c) Milling (polishing)

Figure 1.2. Pictures showing different rice processing methods; (a) manual hand pounding, (b) hulling machine (removes the husk resulting in brown rice) and (c) milling machine (removal of germ and bran which results in white rice). Pictures taken from a local mill, Mobarakeh, Lenjan, Iran



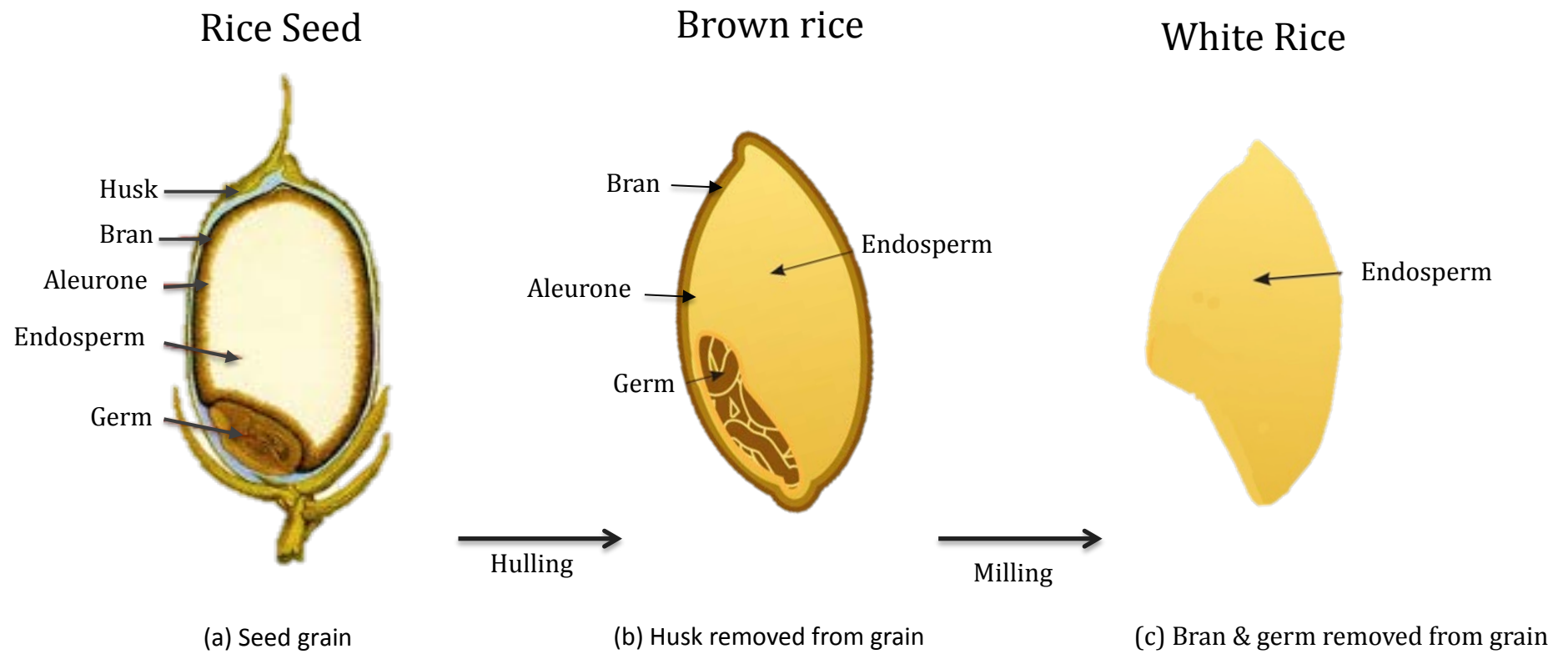


Figure 1.3. Schematic diagrams of a rice seed (a) brown (b) and white (c) rice grains

### 1.2.2 Rice contaminants

Rice is one of the most consumed foods in the world but in recent years there have been concerns over levels of arsenic contamination in rice. Many rice producing and exporting countries have arsenic contamination in their groundwater and soil (Shraim, 2014; Rahman & Hasagawa, 2011), and high levels of arsenic in rice have been reported in different countries around the world (Seyfferth et al. 2014; Zavala et al. 2008; Williams et al. 2006). This is of huge concern as arsenic is a known human carcinogen and is classified as a Group 1 carcinogen by the International Agency for Research on Cancer (IARC, 2016). It is known to cause bladder, lung, and skin cancer and has been associated with increased risk of CVD, neurotoxicity and diabetes (WHO, 2012).

Arsenic and other heavy metals such as cadmium and lead are found naturally in soil and water, but it can also be occur from contamination, as a result of industrial pollution, and agricultural use of arsenic-based pesticides and phosphorous-based fertilizers used to grow the rice (Rohman et al. 2014; WHO, 2012). While all plants can absorb arsenic from soil or water, rice plants do it much more effectively. This is due to the flooded growing conditions that allow rice plants to absorb arsenic more easily through its root system and store it in the grains (Sohn, 2014). Arsenic tends to accumulate in the husk and bran of the rice seed; therefore, brown rice may have higher levels than white rice because the bran is removed during the processing of white rice (Bhadha & Van Weelden, 2016). However, arsenic concentrations in rice vary depending on the grain variety, the region where it is cultivated and whether

contaminated water has been used for irrigation and cooking of the rice (Roy et al. 2011).

However, long-term studies on health effects of exposure to arsenic in rice have yet to be reported in the literature. Arsenic exposure from rice is considered to be an environmental public health concern by scientists around the world (Sohn, 2014; Banerjee et al. 2013; Zhu et al. 2008). This has led to recent adoption of a new standard for acceptable arsenic levels in rice, by the Food and Agriculture Organization of the United Nations and the World Health Organization (FAO/WHO 2014). Recently published longitudinal studies evaluating long-term consumption of white or brown rice have found no associated with either cancer or CVD risk (Zhang et al. 2016; Muraki et al. 2015). However, numerous studies have found a positive relationship between rice consumption and urinary excretion of arsenic in adults and children (Kordas, 2016; Melkonian, et al. 2013; Gilbert-Diamond et al. 2011).

Studies evaluating arsenic levels in Iranian rice samples and agricultural soil were found to be below thresholds set by the Institute of Standards and Industrial Research of Iran and the FAO/WHO and the European Union (Cano-Lamadrid et al. 2015; Nemati, et al. 2014; Rezaitabar, et al. 2012; Falahi et al. 2010).

### 1.3 Iran's nutritional transition

The nutritional transition in Iran began in the 1980s following political and socioeconomic changes after the Iranian Revolution in 1979 which led to major

changes in dietary and lifestyle patterns for Iranians (Ghassemi et al. 2002). These changes shifted the traditional diet that was previously high in fibre, vegetables, nuts, fruits, herbs, moderate amounts of rice and bread towards an increased consumption of calorie dense and lower nutritious foods containing refined carbohydrates, sugars, fats, lower amounts of fruits, vegetables and dietary fibre (Ghassemi et al. 2002). Data collected from the Household Expenditure and Budget Survey show that per capita daily energy has increased from 2000 Kcal in 1970 to 3044 Kcal in 2007 per person (Rahmani et al, 2012). Dietary changes have also been accompanied by a decline in energy expenditure. This is mainly due to rapid urbanisation and employment in less physically demanding jobs, technological advancements including transport, labour saving devices in the home, sedentary activities during leisure time that involve watching television, use of internet and social media. In addition, women have stricter social policies regarding proper attire that prevents physical activities and policies regarding the separation between men and women in public places have resulted in privatisation of social events in homes that gives little opportunity for physical activity (Ghassemi et al. 2002). The health consequences associated with these changes in dietary and lifestyle patterns began to emerge in the 1990s as prevalence and upward trends of obesity and NCDs were reported (Ghassemi et al. 2002; Galal, 2003).

#### 1.3.1 Food security

Limited agricultural production along with 37 years of international sanctions leading to decades of inflationary trends, continuously rising food prices and high unemployment have created challenges for Iran's food security (Heslot, 2014). The

Global Hunger Index measured by the International Food Policy Research Institute (IFPRI) is presently recorded at 6.5 for Iran, indicating that the country is suffering from low-level hunger (IFPRI, 2015). Iran's agricultural production is limited because only 11% of its land is cultivable since most of the land is either desert or mountainous and therefore, Iran imports 45% of its food (Heslot, 2014). Rate of inflation has been high for decades averaging 21.9% since 1990-2012 (UNICEF, 2015). Inflation has raised food prices and shifted the food baskets towards greater dependence on cheaper and less nutritious foods that has impacted the poorer households as well as the middle class (Heslot, 2014). Furthermore, wealth and income disparities exist, especially between rural and urban areas, where rural areas struggle with higher poverty levels (Heslot, 2014). However, poverty has fallen in recent years from 15% to 9% between 2009 and 2013 (World Bank, 2016).

#### 1.4 Diet-related health problems in Iran

After Iran, became established as an Islamic Republic in 1979, a national health service was created and for the first time the entire population had access to universal health care services, which led to a rapid decline in communicable diseases and increased life expectancy (Ghassemi et al. 2002). However, changes in dietary habits and physical activity led to increases in obesity and non-communicable diseases such as T2DM, metabolic syndrome and CVD (Janghorbani et al. 2006). The main burden of disease in Iran comes from NCDs that account for 76% of all deaths whilst, communicable diseases which have been significantly reduced cause 10% of all deaths (WHO, 2016).

Today, both under and over nutrition problems exist in Iran and the main nutritional challenges come from malnutrition, micronutrient deficiencies, obesity and NCDs (Goshtaei et al. 2016). In recent decades, decreasing trends in under nutrition problems in children have been observed, mainly due to the promotion of child health services (Sheikholeslam, 2008). However, malnutrition remains a public health problem and the prevalence of underweight, wasting and stunting among children under the age of five are 3.2%, 4% and 6.8%, respectively (UNICEF, 2015). A number of micronutrient deficiencies are commonly reported these include; iodine, iron, zinc, riboflavin and folate (Mirmiran et al. 2012; Fahed et al. 2011; Ebadi et al. 2008; Fakhrzadeh, 2006). Although, deficiency of iodine has significantly been reduced due to salt iodization in 1996, and goitre prevalence in the population decreased from 53.8% to 5.7%, it still remains an issue albeit smaller (Mirmiran, et al. 2012; Delshad et al, 2010). Iron deficiency anaemia has been found to be common in both children (15-30%) and women (33.4%), and is thought to be caused mainly by low intake of dietary iron (Fahed et al. 2011). Zinc deficiency is also reported to be common, one study found 28.1% of elementary children were deficient and another study found 49% of pregnant women were deficient (Fesharakinia et al. 2009; Salimi et al. 2004). Numerous health conditions have been associated with zinc deficiency including poor developmental growth, depressed immune function, hair loss and increased susceptibility to infections (Brown et al. 2002; Fraker & King, 2004; Bhutta et al. 1999; Black, 1998). Over 97% of men and women are reported to have low folate levels and 40 to 50% are estimated to have riboflavin deficiency (Ebadi et al. 2008; Fakhrzadeh et al. 2006).

Obesity is a known risk factor for T2DM, metabolic syndrome and cardiovascular disease (Zhang, et al. 2008; Sowers, 2003; Chan et al. 1994). Sixty percent of adults in Iran are either overweight or obese, and the prevalence of obesity is higher for women than men i.e. 19% of men compared to 30.6% of women (Janghorbani et al. 2007; WHO, 2016a). Childhood and adolescent obesity has also been associated with higher risk factors for CVD, diabetes and metabolic syndrome (Dhuper et al. 2007; Vivian, 2006; Weiss et al. 2005; Ebbeling, 2002), and increased prevalence of overweight and obesity has also been reported in children and adolescents (Kelishadi et al, 2008).

As prevalence of obesity increased so did T2DM, which has risen significantly from 7.7% to 11.4% during the period between 2005-2011 (Esteghamati et al. 2014). Furthermore, pre-diabetes or impaired fasting glucose (IFG), (Esteghamati et al. 2014) is also common among Iranian adults (14.6%), which is particularly worrying as most people diagnosed with IFG eventually progress to T2DM (Nathan et al. 2007). This puts a strain on health care resources and annual costs were estimated to be \$590 million in 2009 (Esteghamati et al. 2014; Esteghamati et al. 2009).

In recent years, metabolic syndrome has become a public health and clinical challenge since its prevalence and upward trends have been reported worldwide (Borch-Johnsen, 2007; Kaur, 2014). This is true of Iran, where an estimated 37.4% of all Iranian adults have metabolic syndrome, which is even more common in women (Delavari & Forouzanfar, 2009). Metabolic syndrome has strongly been associated with increased

risk of developing CVD and dying prematurely from CVD (Kaur, 2014), which is the predominant cause of mortality in Iran accounting for 46% of all deaths (WHO, 2016).

In summary, the social and economic impacts of diet-related diseases in Iran are enormous, leading to greater morbidity, lower quality of life, shorter life expectancy, health inequalities, increased healthcare costs and loss of productivity which negatively impacts the economy (Ghassemi et al. 2002; Heslot, 2014).

### 1.5 Improving quality of staple foods

In many countries, wholegrain foods such as brown rice, were once the traditional staples, but they have been replaced by refined grains due to technology advancements in processing grains, leading to an overall reduction in nutritional quality of the diet. As refined grains are energy rich and nutrient poor it has been proposed they increase the risk of developing NCDs (Steffen et al. 2003). Whereas, whole grains have been shown to have beneficial effects in preventing many NCDs because they are rich in fibre, vitamins, minerals, phytochemicals and essential fatty acids (Slavin et al. 1999).

#### 1.5.1 White rice consumption in Iran

White rice is consumed up to three times a day in Iran and it is the predominant source of carbohydrate and energy in the diet. It has been estimated that Iranians consume an average of 40 Kg of rice per person every year (Nemati, et al. 2014). White rice plays a central role in Iranian cuisine and the rice dishes are seen as the



centrepieces for each meal. The rice can be cooked in a few different ways; boiled, steamed or baked either by itself or with small amounts of different additives such as herbs, vegetables, legumes, fruit, seeds, fish and meat, creating an endless variety of different dishes (Figure 1.4). In Iran, white rice is supplied via local production as well as through imports from other countries such as India (Nemati, et al. 2014).



Figure 1.4. Examples of dishes cooked with white rice in Iran

## 1.5.2 Health impacts of white rice consumption

### 1.5.2.1 Metabolic syndrome

Metabolic syndrome is characterised by a group of medical conditions or risk factors that cluster together such as; abdominal obesity, raised blood pressure, insulin resistance and dyslipidaemia (Alberti et al. 2005), that are associated with elevated risk of developing T2DM, CVD and dying prematurely (Kaur, 2014). Several studies among Asian populations have indicated that habitual consumption of white rice maybe a critical dietary risk factor for development of metabolic syndrome (Bahadoran et al. 2014; Villegas et al. 2007; Radhika et al. 2009; Song et al. 2014). For example, a cross-sectional study carried out among Korean adults found positive association between habitual white rice consumption and metabolic syndrome (Song et al. 2014). Similarly, a prospective study conducted in Iran also found daily consumption of white rice was associated with higher occurrence of metabolic syndrome (Bahadoran et al. 2014). The authors found that when more than 25% of total daily energy intake was from white rice, the risk of developing metabolic syndrome increased up to 66% in men and women (Bahadoran et al. 2014). Conversely, in a study by Shi et al. (2012) among Chinese adults, no association between habitual consumption of white rice and metabolic syndrome was found, although the authors did notice a positive association between higher intake of white rice and elevated fasting blood glucose levels (Shi et al. 2012; McKeown, 2002). More recently a systematic review concluded that habitual white rice consumption increased the risk for developing metabolic syndrome (Izadi & Azadbakht, 2015). This maybe explained by the fact that rice has a high glycaemic index and when it is consumed as a staple food, like in Asian populations (including

Iran), it becomes the main contributor to dietary glycaemic load, which has been shown to elevate plasma glucose, triglycerides and high-density lipoprotein levels (Hu et al. 2012; Frost et al. 1999; Liu et al. 2000).

#### 1.5.2.2 Type 2 diabetes

Habitual white rice consumption has been associated with an increased risk of developing T2DM in Asian populations when it is eaten as a daily staple (Radhika et al. 2009; Murakami et al. 2006; Villegas et al. 2007). As the glycaemic Index (GI) value of white rice is high it has been proposed that in populations who consume white rice as a staple food, it leads to a high dietary glycaemic load which has been consistently associated with elevated risk of developing T2DM (Barclay et al. 2008; Villegas et al. 2007; Murakami et al. 2006). For example, in a large prospective study, consumption of white rice increased the risk of developing T2DM among Chinese women (Villegas et al. 2007). In addition, higher consumption of refined grains has also been associated with insulin resistance and metabolic syndrome in a population of Indians who habitually consumed high-carbohydrate diets (Radhika et al. 2009). More recently a meta-analysis of prospective cohort studies conducted amongst both Asian and Western populations also found higher consumption of white rice was significantly associated with elevated risk of developing T2DM (Hu et al. 2012). The association was found to be significantly stronger for Asians than for Western populations and a dose-response was also reported, where each serving of white rice consumed per day increased the risk associated with developing T2DM by 11% (Hu et al. 2012).

Global prevalence of T2DM has been rising for decades and approximately 422 million people worldwide (in 2014) have the disease (WHO, 2016b). However, T2DM prevalence has been rising more rapidly in middle- and low-income countries (WHO, 2016b), like Iran, who have seen a 35% upward trend in T2DM in recent years, and more people being diagnosed with impaired fasting glucose (IFG) or pre-diabetes (Esteghamati et al. 2014; Harati et al. 2009).

#### 1.5.2.3 Cardiovascular disease

Although, several studies have found strong associations between white rice consumption and increased risk of developing metabolic syndrome and T2DM, this is not true for CVD. Results from a recent pooled analysis of three cohorts (n= 207,556) found that habitual consumption of white or brown rice is not associated with increased CVD risk (Muraki et al. 2015). A cross-sectional study carried out in Iran also found no association between white rice consumption and CVD among Iranian men (Khosravi-Boroujeni et al. 2013). However the number of studies are limited in examining the effects of habitual white rice consumption and CVD.

#### 1.5.2.4 Obesity

Obesity is a major growing public health problem for developed as well as developing countries like Iran, where prevalence of overweight is reported to be 63.1% in women and 58% in men (WHO, 2016a). Obesity is a risk factor for many dietary-related NCDs including T2DM, metabolic syndrome, CVD risk and cancers (Zhang, et al. 2008).

Habitual consumption of high GI foods like white rice lead to postprandial

hyperglycaemia and hyperinsulinaemia and high GI diets are thought to promote body fat storage by inhibiting lipolysis and inducing lipogenesis (Ludwig, 2002; Brand-Miller et al, 2002). For example, Kim et al. reported that habitual white rice consumption was associated with obesity in Korean adults (Kim et al. 2012) and a cohort study from the US found intakes of refined grains to be positively associated with weight gain (Liu et al, 2003). Another study also found higher intakes of refined grains to be associated with higher visceral adipose tissue (McKeown et al. 2010). However, there are reports that conflict with these studies, for instance, Kolahe Douzan et al. (2012) found no significant association between frequency of white rice consumption and obesity in adults in Iran (Kolahe Douzan et al. 2012). Interestingly, in another study it was reported that white rice intake was inversely associated with weight gain in Chinese adults (Shi et al. 2011). These conflicting reports may be explained by the differences in GI values of refined grains used in the studies, as GI values of white rice vary widely depending on the variety, amylase content, processing and cooking method (Foster-Powell et al, 2002). The average reported GI value for white rice is 64 however GI values have been reported up to 100 (Foster-Powell et al, 2002), and for some varieties of Iranian rice, low GI values have been reported. For example some reports have indicated the GI of binam rice as  $44 (\pm 9)$ , (Darabi et al. 2000) and the GI of sorna pearl rice as  $52.2 (\pm 5.1)$ , (Zarrati et al. 2008).

### 1.5.3 Benefits of Substituting whole grains for refined grains

Whole grains such as brown rice contain many beneficial protective factors that are thought to reduce the risk of developing many NCDs such as fibre, vitamins and

minerals, and essential fatty acids (Kazemzadeh, 2014). Findings from many studies suggest favourable associations between whole grain intake and obesity, diet-related NCDs and mortality (Aune et al. 2013; Ye et al, 2012; Mckeown, 2002; Steffen, 2003). For example, a systematic review and meta-analysis of prospective studies of grain consumption and T2DM concluded that higher whole grain intake was associated with reduced T2DM, and a positive association was found between intake of white rice and T2DM (Aune et al. 2013). Another long-term cohort study reported that increased intakes of whole foods might reduce metabolic risk factors for cardiovascular disease and T2DM (Mckeown, 2002). The association was strongest amongst overweight participants where a significant inverse association between whole grain intake and fasting insulin was found (Mckeown, 2002). In contrast, a dietary intervention trial found substituting brown rice for white rice did not substantially improve metabolic risk factors in Chinese men and women (Zhang, et al. 2011). However, another systematic review and meta-analysis reported beneficial effects of whole grains on reducing the risk of T2DM, CVD and weight gain (Ye et al, 2012). In addition, findings from a large 11-year prospective study from the US concluded that the intake of whole-grain food was inversely associated with total mortality and the incidence of coronary artery diseases (Steffen, 2003).

Brown rice has lower glycaemic index than white rice and replacing white rice with brown rice has been found to lower the risk of developing T2DM, for example; in a prospective cohort study of US men and women it was found that consuming two servings a week of brown rice lowered the risk of T2DM and replacing 50g of white rice

with the same amount of brown rice, lowered the risk of T2DM by 16% (Sun et al. 2010). Furthermore, brown rice has 4 times as much fibre than white rice (Benno et al. 1989), which has been shown to lower postprandial blood glucose levels (Seki et al. 2005), and improve insulin sensitivity (Salmeron, 1997). Mohan et al. (2014) found that consumption of brown rice in place of white rice improves glucose and fasting insulin responses among overweight Asian Indians.

### **1.6 Conclusions and further work**

In summary, there is strong evidence supporting the need to change the type of carbohydrate consumed in Iran from refined to complex. Consistent findings in the literature report a positive relationship between white rice intake and T2DM, and most studies report that habitual consumption of white rice is associated with metabolic syndrome. Furthermore, studies reliably report, whole grains such as brown rice are associated with lower risk of diseases including, T2DM, metabolic syndrome and CVD risk factors and obesity. The recent nutritional transition in Iran shifted dietary patterns towards more energy dense and less nutritious foods resulting in an increased consumption of refined carbohydrates, sugars, fats and lower dietary fibre. This was further compounded by persistent inflationary trends that have dominated the economy in Iran for decades, raising food prices and shifting food baskets towards greater dependence on cheaper and less nutritious foods. These dietary trends have led to an increase in prevalence of obesity, T2DM, metabolic syndrome and CVD in Iran. Today, 60% of the population are either obese or overweight, over 11% of the population have been diagnosed with T2DM and, most people die of CVD.



Malnutrition problems still exist in some younger children and micronutrient deficiencies are prevalent in Iranian adults especially iron, riboflavin and folate. There are wealth and income disparities between urban and rural areas where rural areas struggle with higher poverty levels and poverty has been estimated to be around 9% (Heslot, 2014; World Bank, 2016). In recent years, there are some concerns around consumption of rice due to potential arsenic exposure especially in brown rice, which has led to international acceptable arsenic levels in rice being established. There are reports that rice in Iran has arsenic levels within the established acceptable limits however, locally produced rice is not routinely analysed. White rice is a staple food in Iran and maybe consumed up to three times a day and is the predominant carbohydrate in the diet. However, white rice is a refined carbohydrate, which has been stripped of its fibre and nutrients and has high glycaemic index and has been associated with increased risk of several NCDs. In contrast, brown rice is a whole grain and rich in fibre, nutrients, minerals and phytochemicals and has been associated with reduced risk of several NCDs. Changing quality of dietary carbohydrates in Iran by replacing white rice for brown rice could potentially improve population nutrition, and have an impact on reducing diet-related diseases. However, it is unknown whether changing the current white rice staple to brown rice would be culturally acceptable since recent generations of Iranians have had little or no previous exposure to brown rice. Therefore, an exploratory study to assess perceptions and willingness of changing the type of rice staple should be undertaken.

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# **Part Two**

Research Project Report

## **Perceptions of Introducing Brown Rice into the Diet of Iranians in Lenjan County, Isfahan, Iran**

Key words: Nutrition; Health; Knowledge; Women

Word Count: 4209

### Journal selection for publication

Public Health Nutrition is a monthly journal published by the Nutrition Society in the UK. It has an international readership with an impact factor of 2.68. It publishes peer-reviewed research that focuses on the promotion of good health through nutrition and the prevention of nutrition-related illnesses. The findings of this study will increase community awareness about the role of brown rice in nutrition and health and aid the development of public health interventions about the type of rice consumed in Iran. It is considered appropriate for publication in this journal. The journal's manuscript format guidelines have been followed with the exception of line spacing, margin widths and referencing, instead University of Chester dissertation submission guidelines have been adhered to.

### Abstract

**Objective:** To understand Iranian women's perceptions of brown rice and to assess their willingness to substitute the commonly consumed white rice for brown rice in their own and family diets.

**Design:** A cross sectional survey was used to examine women's perceptions of brown rice and assess their willingness to substitute brown rice for white rice in their diets. As part of the study, participants gained knowledge about the health and nutritive benefits of brown rice, tasted different brown rice dishes and given the opportunity to cook it in their own homes following cooking guidance and recipes.

**Setting:** Lenjan County, Isfahan, Iran.

**Subjects:** 106 (n) Iranian women over 18 years living in the Lenjan area who cook and eat rice.

**Results:** The study revealed that most participants (59.4%) had little awareness about brown rice or its nutritive properties and the majority (79.2%) had never tasted it before. It was found that despite frequent consumption of white rice most participants (95%) and their families liked the taste of the brown rice and would cook and eat it on a regularly basis if available locally.

**Conclusions:** The present study suggests that brown rice replacement in the diet of Iranians would be culturally acceptable as participants liked its overall taste and wanted to eat healthy food. A dietary intervention to change the staple rice quality in Iran has the potential to improve population health and have an impact on reducing diet-related diseases.

## 2.0 Introduction

Iran's nutritional transition following rapid urbanization and socio-demographic changes has resulted in a lower quality of diet for Iranian families (Ghassemi et al. 2002; Farahmand et al. 2012). This change in dietary pattern is associated with an increase in diet-related non-communicable diseases (NCDs) such as obesity, type 2 diabetes mellitus (T2DM) and cardiovascular disease (CVD), (Sarraf-Zadegan et al. 1999; Azizi et al. 2002), which are the predominant causes of morbidity and mortality in Iran today (WHO, 2016).

White rice is a staple food of Iran but unlike brown rice, it has been stripped of its fibre, nutrients, minerals and essential oils during the milling process and has a higher glycaemic index (GI), (Bahadoran et al. 2014). A meta-analysis review found that higher consumption of white rice is significantly associated with higher risk of T2DM in Asian populations (Hu et al. 2012). Furthermore, high consumption of refined carbohydrates such as white rice and flat bread, which are the main dietary components in Iran have been linked to increasing prevalence of several NCDs in Iran (Bahreynian et al. 2012). In contrast, consuming whole grains as brown rice has been shown to reduce the risk of T2DM (Sun et al. 2010), lower systemic inflammation in the body and assist in losing weight (Kazemzadeh et al. 2014).

Substituting brown rice in place of white rice would greatly improve the quality of dietary carbohydrates consumed in Iran. However, brown rice is not freely available in Iranian markets and recent generations have had little or no exposure to brown rice. In

addition, rice plays an important role in Iranian cuisine. A wide variety of aromatic fluffy white rice dishes are regarded as the centrepieces for Iranian meals and are served with cultural pride to family and guests. Therefore, it is not known, whether Iranians would be willing to change rice type even if it was made available in local markets. As women play a central role in shaping dietary patterns within their families (Davison & Birch, 2001), an explorative study was designed recruiting women to assess cultural feasibility of changing the rice staple. Through a survey questionnaire, promotion of brown rice health benefits, taste testing and a cooking trial, women's perceptions about brown rice and willingness to replace white rice for brown rice in their diets was explored in a local community that grows its own rice.

#### 2.01 Aim and Objectives

The overall aim of this explorative study was to determine whether brown rice could be successfully introduced into the Iranian diet as a healthy and affordable alternative to white rice. The main objectives were to understand Iranian women's perceptions of brown rice and assess their willingness to substitute white rice for brown rice in their own and family's diet in Lenjan County, Isfahan, Iran.

## 2.1 Methods

### 2.1.1 Study Design

The study used a cross sectional survey design that was developed specifically for the study. It was designed to explore women's pre-existing knowledge about brown rice, and assess their willingness to replace white rice with brown rice, following education on health benefits of brown rice, brown rice taste testing and a cooking trial at home. Lenjan County in Isfahan was chosen as the location for the study because the local community grow and consume their own rice. A survey questionnaire was selected as the best way to collect information on the views of the local women, as it is an efficient way to gather a large amount information quickly, provides a written record and has no interview bias (Rea & Parker, 2014). To assess participants' likeability and acceptability of the brown rice, sensory traits including taste, flavour, appearance, texture and overall liking were measured using a 5-point hedonic scale as sensory testing through acceptance or liking tests are often used in the food industry to determine consumer acceptability of a food product (Lawless & Heymann, 1999).

### 2.1.2 Participants

The study recruited 110 local women from Lenjan County by word of mouth and recruitment flyers (Appendix 4). Screening criteria for the study, included women over the age of 18 years old, who live in Lenjan as well as cook and eat rice. A participant information sheet (Appendix 2) explaining the study, including confidentiality and anonymity were given to all interested participants. All enrolled participants signed informed consent forms to take part in the study (Appendix 3). The study aimed to

recruit 100 women, as this number is considered adequate for food sensory acceptability testing (Chambers & Baker Wolf, 1996).

### 2.1.3 Brown Rice

As brown rice is not readily available for purchase in Iran, rice was obtained directly from a local rice farmer in the village of Siahboom and taken to a mill in Mobarakeh, a local nearby town for de-husking to produce brown rice for the study. To create culturally accepted brown rice dishes for the study, a small group of local women were asked to help adapt some traditional Iranian white rice dishes with brown rice. Several dishes were optimized and three popular consumed dishes were chosen to be used in the study, these were plain boiled rice called 'Kateh'; steamed rice cooked with tomato known as 'Estamboli Polow' and baked rice with lentils and raisins known as "dampokht". These rice dishes were served for dinner with chicken and lamb kebab during the study.

### 2.1.4 Questionnaire Survey and Procedure

Three self-completed survey questionnaires were developed using closed ended questions and scaled using Likert (Likert, 1932) and Hedonic scales (Peryam & Girardot, 1952), (Appendix 5). The survey questionnaires were initially developed in English and then translated into Farsi (Iranian language) for reliability testing and data collection. Following data collection the survey questionnaires were retranslated back to English for coding and data analysis.

Prior to the study, the questionnaires were reviewed by subject matter experts at University of Chester in the UK and Tehran Medical Sciences University in Iran.

Reliability and content of the survey were evaluated using ten local women from Lenjan County, Isfahan, Iran. Cronbach's alpha (Cronbach, 1951) was calculated for each questionnaire and section, and correlations ranged from 0.708 to 0.940.

According to Kline (1993) these were acceptable ranges as the minimum requirement for internal consistency has been recommended as 0.7.

Participants were asked to meet at a local venue called 'Talare Ghaem' in the town of Mobarakeh, for the study. Questionnaire one, was completed prior to tasting brown rice, questionnaire two was completed post-tasting and after education on the nutritive and health benefits of brown rice (Appendix 6) at the venue, whereas, questionnaire three was completed 7 days later following a cooking trial at home.

Questionnaire one, section A looked at eating habits with an emphasis on white rice consumption patterns and pre-existing knowledge of brown rice, section B measured diet-disease awareness using a modified version of one section of Parmenter and Wardle's (1999) Nutrition Knowledge Questionnaire (section 5, 'Awareness of Dietary Disease Associations' was adapted). Questionnaire two, section A, looked at participants' liking for and acceptability of the brown rice served for dinner and willingness to substitute it in their diet, and Section B, collected socio-demographic information from the participants. Each participant was given a sample bag of brown rice (1 Kg) along with cooking guidance and recipes to take home. Questionnaire three



was completed 7 days later, after cooking and eating the rice at home with their families. It looked at their cooking experiences, family views, liking for and willingness to substitute brown rice for white rice.

#### 2.1.5 Data Collection and Analysis

Participants were asked to self-complete all three questionnaires and any participants who did not complete all questionnaires were excluded from analysis (n=4), questionnaires from 106 women were analysed. Questionnaires one and two were completed at the study venue and questionnaire three was collected from participants' homes or returned by mail.

As the questionnaires were scaled using Likert and Hedonic scales the data were classified as ordinal. Following retranslation back to English, the data were analysed using descriptive statistics, frequencies and percentages, cross tabulations and Chi-square test for association with  $\alpha = .05$  as criterion for significance (Healy, 2009). The Statistical Package for Social Sciences version 22.0 (IBM SPSS, NY, USA) was used for all statistical analysis.

#### 2.1.6 Ethics

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the Ethics Committee of Tehran University of Medical Sciences in Iran (Appendix 1). Written informed consent was obtained from all subjects.

## 2.2 Results

Table 2.1 summarises the socio-demographic characteristics of the study population. 106 women completed the study, with a median age range of 35-44 years (IQR 25-34 to 45-54), although 110 women enrolled in the study, four participants' were excluded because they did not complete all three questionnaires. Most of the women were married (89%) and literate (86.8%), although 26% of them had either no education or just primary school education. University was the most frequent and highest category of education reported (31.1%) followed by secondary school (24.5%). Most participants had children (78.3%) and the median household size was 4 (IQR 3 to 4). Around 20% reported to be employed whilst 70% were either stay at home housewives or daughters not yet married. The median monthly income was between 700,000 – 1 million Toman (\$203 - \$290) and the median weekly cost of food was between 100,000 to 200,000 Toman (\$29 - \$58), food expenditure was calculated to be between 57 to 80% of total income. However, only 5.8% reported to struggle to frequently buy food with 32% stating sometimes compared to 60.4% who rarely or never reported it.

Chi-square tests of independence found statistical significant relationships between level of schooling and employment, monthly income, and health (Table 2.2). Those who were better educated were more likely to work outside the home [ $\chi^2$  (2, N = 106) = 13.80, p = .001], have a higher monthly income [ $\chi^2$  (4, N = 96) = 14.68, p = .005] and have better reported health [ $\chi^2$  (2, N = 106) = 16.07, p = .001].

Table 2.1 Socio-demographic characteristics of study participants (n=106 women)

Socio-demographic Characteristics	Number	Percentage	Median (IQR) <sup>1</sup>
Age group (years)			35-44 (25-34 to 45-54)
18-24	15	14.2	
25-34	21	19.8	
35-44	29	27.4	
45-54	22	20.8	
55-64	13	12.3	
65-74	6	4.7	
75+	1	0.9	
Marital status			
Single	8	8.5	
Married	89	84	
Widowed	8	7.5	
Children			
No	23	21.7	
Yes	83	78.3	
Number in household			4 (3 to 4)
Literacy			
Literate	92	86.8	
Illiterate	14	13.2	
Education level			
No schooling	8	7.5	
Primary	20	18.9	
Middle	9	8.5	
Secondary	26	24.5	
Pre-university	10	9.4	
University	33	31.1	
Employment			
Unemployed	8	7.5	
Employed	21	19.8	
Housewife/living at home	74	69.8	
Student	3	2.8	
Monthly income (\$)²			203-290 (203-290 to 290-581)
Weekly food cost (\$)²			29-58 (14-29 to 58-87)
Health issues			
No	57	53.8	
Yes	49	46.2	

<sup>1</sup> IQR = Q1 to Q3<sup>2</sup> Monthly income and weekly food cost shown in US dollar

Table 2.2 Associations between level of schooling and employment, monthly income and health issues

	Employment (n=106) n (%)			Monthly Income (n=96) (\$) n (%)				Health Issues (n =106) n (%)		
	No	Yes	P	>203	>203 - 290	>290	P	No	Yes	P
Schooling			.001				.005			.005
None & primary	26 (92.9)	2 (7.1)		7 (25)	14 (50)	7(25)		9 (32.1)	19 (76.9)	
Middle to secondary	32 (91.4)	3 (8.6)		7 (22.6)	11 (35.5)	13 (41.9)		15 (42.9)	20 (57.1)	
Pre/university	27 (62.8)	16(37.2)		1 (2.7)	11 (29.7)	25 (67.6)		33 (73.7)	10 (23.3)	

\* p value calculated using Chi-square test of independence, level of significance  $p < .05$

All of the participants in the study consumed white rice. Figure 2.1 illustrates how often rice is eaten for breakfast, lunch and dinner. It was determined that rice is habitually eaten for both lunch and dinner but rarely for breakfast (which would normally be as a porridge) with 88.7% reporting to never eating it. Rice was more commonly eaten for lunch than dinner with 32.1% reporting to consume it everyday for lunch compared to 17.9% for dinner. However, over half of the participants reported to consume it a few times a week for both lunch (54.7%) and dinner (56.6%).

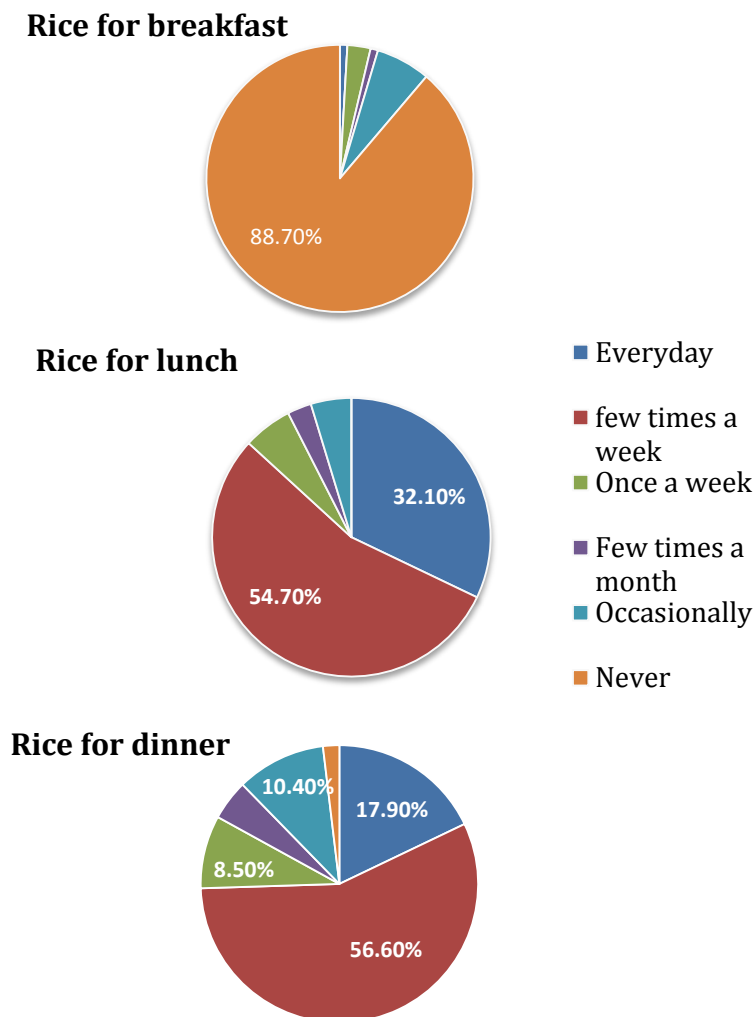


Figure 2.1. White rice consumption patterns (percentage frequency)

More rice was consumed at lunchtime compared to dinnertime and the average portion size of cooked rice eaten for lunch was 254g ( $\pm$  73) compared to 227g ( $\pm$  79) for dinner. No statistical relationships were found between frequency and amount of white rice consumed and sociodemographic characteristics of the study participants.

Pre-existing knowledge of whole grains and brown rice was assessed and the results are shown in Figure 2.2. It was determined that participants had good general awareness about whole grains with 69.8% aware of the difference between whole and refined grains. However, over half of the participants had no prior awareness of brown rice (59.4%), and some participants thought it was specially grown rice and one thought it was dirty or unclean rice. Furthermore, most had never even tasted it before (79.2%), among those that had, reported to tasting it only once or rarely but liked the taste. The exception was two participants who reported to consume brown rice on a regular basis, they were related and owned a rice farm and processed some of their rice to brown rice. A significant association was found between literacy and knowledge of brown rice, those who were illiterate were less likely to know what brown rice was  $\chi^2 (1, N = 106) = 4.62, p = .032$ .

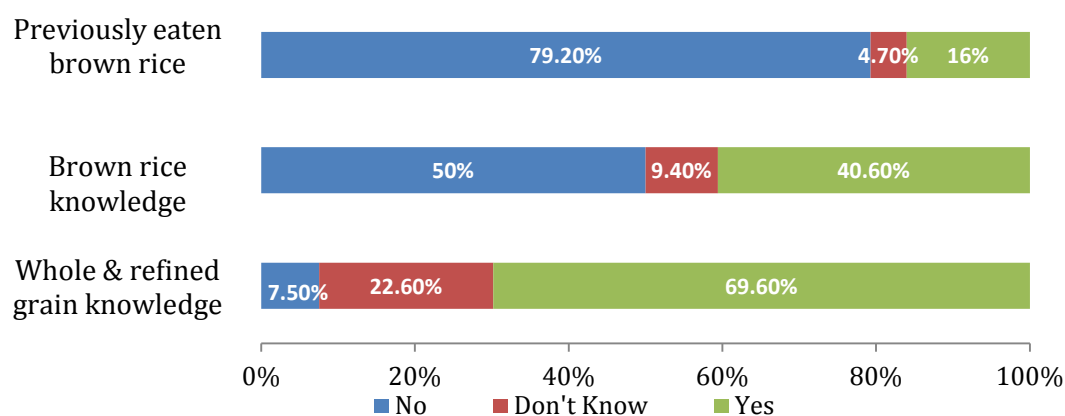


Figure 2.2. Pre-existing knowledge about whole grains and brown rice (percentage frequency)

Figure 2.3 shows participants' understanding of how diet impacts health as well as knowledge of diet-disease relationships. Most participants were aware that diet impacts health (85%) and knew consuming excessive amounts of salt (89%), fat (83%)

and sugar (82%) were detrimental to health. Furthermore, most participants were able to name one or more diseases associated with excessive salt (90%), fat (80%) and sugar (85%). However, associations between disease and low dietary intake of fibre, fruit and vegetables were the least understood. Sixty three per cent of participants did not know that low dietary fibre can impact health and 58.5% could not name one disease associated with it. A similar pattern was seen for low consumption of fruit and vegetables, where 53.8% were not able to name one disease associated with it and 46% were unaware of any health consequences. No significant associations were found between diet-disease knowledge scores and sociodemographic characteristics of study participants.

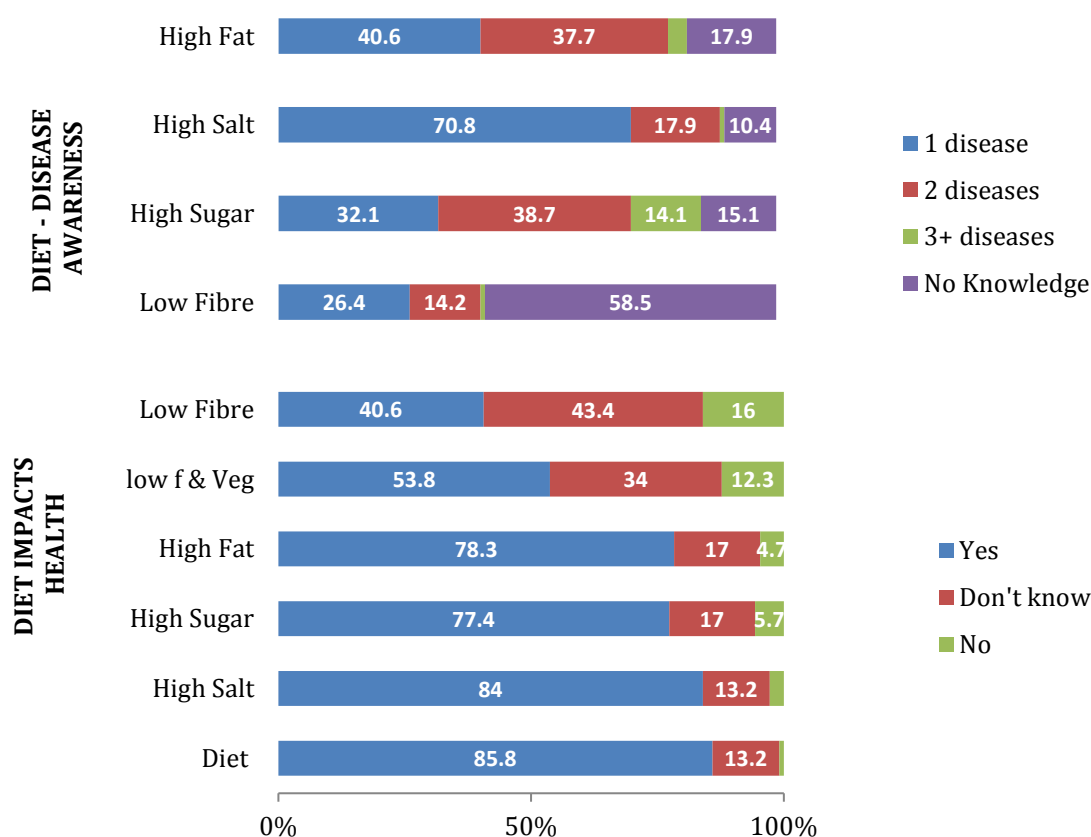


Figure 2.3. Participants' knowledge of how diet impacts health and disease (% frequency)

Each participant was given a sample bag of brown rice (1Kg) to cook during 7 days and out of 106 participants, 103 cooked the rice, the three participants who did not cook the rice stated they hadn't found the time but were planning on cooking it at some point. Figure 2.4 shows the taste testing likability ratings for brown rice from the study venue and cooking trial at home. Sensory properties, including overall liking, smell, flavour, texture and appearance of the brown rice dishes were rated on a 5-point hedonic scale. The scores for overall liking, flavour and smell were high, with around 80% reporting to like it very much and many participants commenting on the rice being 'very tasty' with good aroma, whereas, texture and appearance scored lower. Around 50% of participants reported to like the texture very much, whilst 8% and 3% from the study venue and cooking trial reported to dislike the texture. However, appearance scored the least of the sensory measures and only 41% and 33% of participants from the study venue and cooking trial reported to like the appearance of cooked brown rice very much and 14% (study venue) and 5.5% (cooking trial) disliked it. Those who reported to dislike the appearance commented on the fact that the rice didn't look pretty or grow long and would not be suitable to serve to guests.



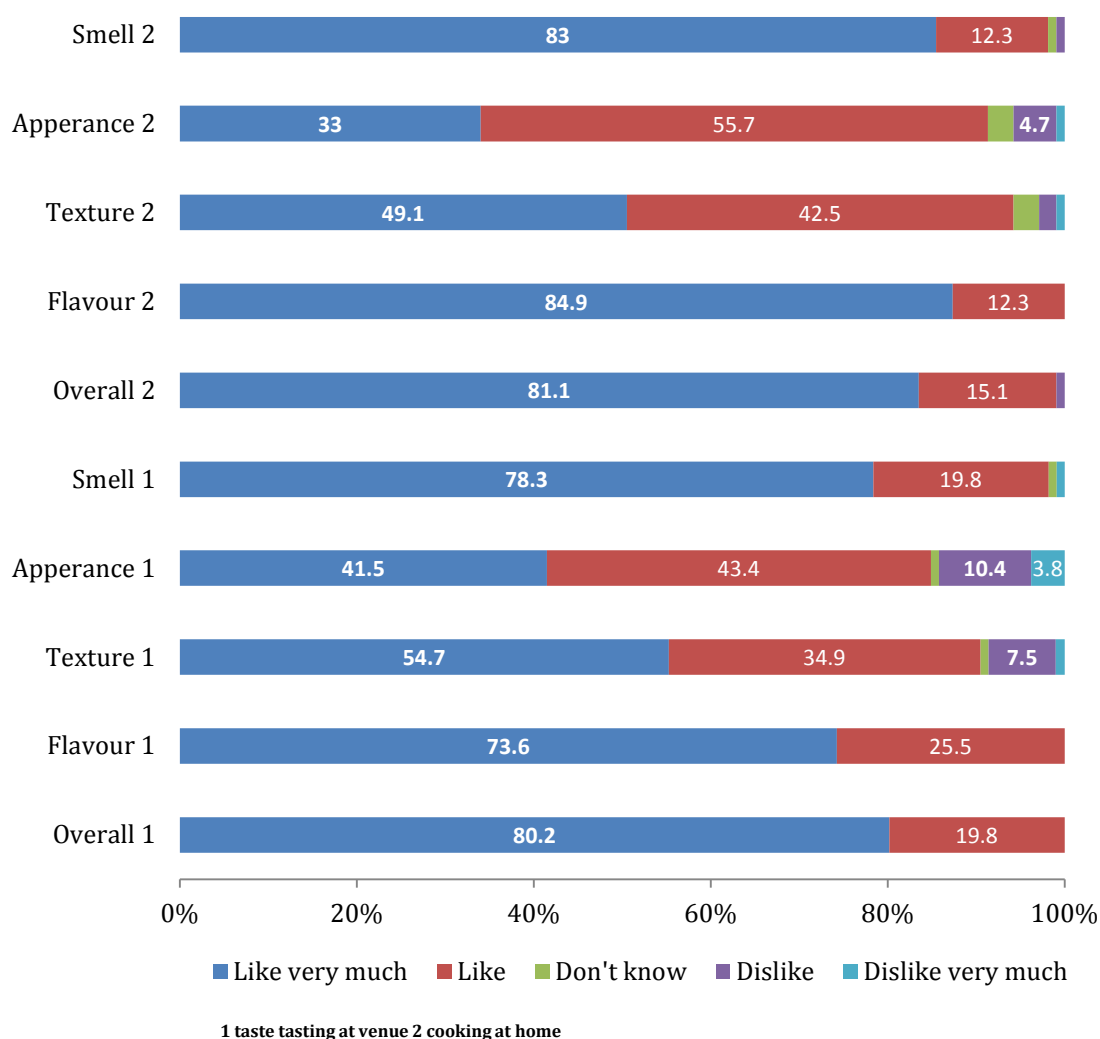


Figure 2.4. Brown rice taste testing likability ratings (5 point hedonic scale), from the study venue and cooking trial at home (percentage frequency)

Participant willingness to substitute white rice for brown is shown in Table 2.3. Ninety-five per cent reported that they would continue to eat brown rice if made available in local markets because it is tasty and has health benefits and 95% would recommend it to friends and family. During the cooking trial at home, most participants (78.3 %) reported to have no problems cooking the rice and only one person reported to have had difficulty, however, 17.9% reported some difficulty. Those who reported some

difficulty related it to the amount of water needed to cook the rice and if they used too much water the rice became a 'little soggy'. Sixty-four per cent of family members who had the opportunity to try brown rice during the cooking trial, reported to like it, whereas, 24.5% families reported that it was mixed with some family members liking it and others not. The main comments by those who reported the likability within the family to be mixed were: the children didn't like it; they prefer the taste of white rice; it didn't look as nice as white rice. When asked how often they would cook brown rice 34% of participants said they would cook it few times a week and around half expressed their willingness to cook and eat it once a week if available.

Table 2.3 Participants' willingness to substitute brown rice into their diet (% frequency)

Questions	Survey Responses (n=106)	
	Taste testing venue n (%)	Cooking trial at home (n=103) n (%)
<b>Will you continue to eat brown rice</b>		
Yes	101 (95.2)	101 (95.3)
Don't know	3 (2.8)	2 (1.9)
No	2 (1.9)	-
<b>Will you purchase brown rice</b>		
Yes	100 (94.3)	101 (95.3)
Don't know	5 (4.7)	2 (1.9)
No	1 (0.9)	-
<b>Will you recommend brown rice</b>		
Yes	102 (96.2)	101 (95.3)
Don't know	4 (3.8)	2 (1.9)
<b>Were there any cooking issues</b>		
No	-	83 (78.3)
A little		19 (17.9)
Yes		1 (0.9)
<b>Did family members like the brown rice</b>		
Yes	-	68 (64.2)
Mixed (some did others didn't)		26 (24.5)
<b>How often would cook brown rice</b>		
Every day	4 (3.8)	4 (2.8)
Few times a week	54 (50.9)	36 (34)
Weekly	29 (27.4)	54 (50.9)
Twice a month	11 (10.4)	5 (4.7)
Monthly	3 (2.8)	-
Rarely	4 (3.8)	1 (0.9)
Don't know	1 (0.9)	3 (2.8)

## 2.6 Discussion

This exploratory study was conducted to understand women's perceptions of brown rice and assess cultural acceptance of it as a healthy alternative to the usually consumed white rice in Iran. The main finding of the study suggests that brown rice substitution for white rice would be culturally acceptable as most participants and their families liked the taste, found it easy to cook with and wanted to eat healthy nutritious food. Furthermore, most participants expressed willingness to continue to eat brown rice either weekly or a few times a week.

White rice is a staple food in Iran and a major dietary source of energy and carbohydrate for the Iranian population (Bahreynian & Esmailzadeh, 2012). However, in contrast to brown rice, white rice has been stripped of its fibre, nutrients, minerals and essential oils, during the milling process and has a higher glycaemic index (Bahadoran et al. 2014). Habitual consumption of white rice has been associated with higher risk of T2DM (Hu et al. 2012) obesity (Kim et al. 2012), and metabolic syndrome (Radhika et al. 2009). Whilst consuming whole grains such as brown rice have been shown to lower the risk of T2DM (Sun et al. 2010), reduce metabolic risk factors for CVD (McKeown et al. 2002), and assist in losing weight (Ye et al. 2012). In Iran, 25% of the population are obese, 37% have metabolic syndrome, over 10% have T2DM and most people die of CVD (46% of all deaths), (Delavari & Forouzanfar, 2009; WHO, 2016). Therefore, improving quality of carbohydrates in the diet through substitution of brown rice for white rice may offer health benefits and help reduce the burden of obesity and its associated diet-related diseases such as T2DM in Iran.

In some Asian countries where rice is a staple food it maybe consumed up to three times a day, providing the major source of daily energy and calories in the diet (Wang, 2002; Radhika et al. 2009; Kolahehdouzan et al. 2013; Eshak et al. 2011). In this study it was found that white rice is habitually consumed for lunch and dinner but rarely for breakfast. On average of 3 or more servings were consumed per meal. In comparison the average rice intake in China is around 6 servings a day and in India where rice is eaten for each meal, around 8.5 servings a day are consumed (Mohan et al. 2010) and in western countries only 1 to 2 servings a week are consumed (Sun et al. 2010). Hu et al. (2012) found a dose-response relationship between white rice consumption and risk of developing T2DM and every additional serving of white rice was associated with 11% increase in risk of T2DM.

Brown rice was rarely consumed amongst the participants and almost 80% reported to never have eaten it before. Other studies also found consumption of brown rice rare in countries where white rice is the staple (Zhang et al. 2010; Sudha et al. 2013; Muhihi et al. 2012). Perceptions that it is better quality, whiter, cleaner and associated with higher socio-economic status have been reported to explain preference for white rice over brown rice (Chandramouli, 2001). This was found to be true in China where a strong perception that brown rice is inferior in taste and quality to white rice was reported (Zhang et al. 2010). However, in Iran, brown rice is not readily available in local markets, which may explain the reason why many participants reported to have no prior knowledge or had eaten it before. This was also found to be true in a

Tanzanian study where unavailability and high cost were reported as the main barriers to consumption of brown rice (Muhihi et al. 2012).

The taste testing scores were high especially for overall liking, flavour and smell and many participants found the brown rice dishes to be very tasty with good aroma. Whereas, texture and appearance scored lower but not significantly so. In family members, who reported not to like brown rice, the main comments were: the children didn't like it or it didn't look as nice as white rice. Appearance of cooked brown rice also received the lowest rating amongst married women and the main concerns reported were that it did not grow long, look pretty and would not be suitable to serve to guests. As hospitality plays a central cultural role in Iran, and entertaining guests and serving attractive culinary dishes is highly valued. Women's perception that brown rice is not appealing to serve to guests maybe a barrier. Some difficulty was reported in cooking brown rice, resulting in some dishes having a 'soggy' texture, this relates to unfamiliarity of cooking brown rice and amount water used during cooking. In an Indian intervention study the main barriers reported for the acceptance of brown rice were its chewy texture, poor appearance and longer duration of cooking time (Sudha et al. 2013).

The overall, knowledge of diet-disease associations were found to be good for salt, fat and sugar, but least understood for low dietary intake of fibre, fruit and vegetables. In addition knowledge of brown rice and its nutritive and health benefits were low amongst the majority of participants. This gap in nutritional knowledge highlights a

need for nutrition education promoting the benefits of whole grains, fruit, vegetables and fibre in the diet of Iranians. Previous studies have revealed that individuals with higher nutrition knowledge are more likely to consume healthier diets (Wardle et al. 2000; Ball et al. 2006; Turrell & Kavanagh, 2006; Geaney, 2015), and nutritional knowledge maybe a motivator for introducing brown rice into the diet (Zhang et al. 2010; Vasudevan et al. 2013). This was the case in this study too, as 'health benefits of brown rice' were reported as a key reason why participants would continue to eat brown rice. Intervention studies that explored substituting whole grains for refined grains in reducing diabetes found similar results that participants' were more willing to consume brown rice after learning about its nutritional value (Zhang, et al. 2010; Sudha, et al. 2013). In this study no associations were found between education and knowledge scores amongst participants, which was not as expected and contrasts with the literature, since many studies have reported a relationship between level of education and nutritional knowledge (Parmenter et al. 2000; Peltzer, 2004; Holdsworth et al. 2006;). This difference maybe explained by high information sharing amongst extended families in Iran.

Rice is an important crop for the world's poor and food insecurity is often reported in countries where rice is the predominant staple (FAO, 2010; Bishwajit et al. 2013; Timmer, 2014). In Iran, food security has been impacted by inflation (37 years of international sanctions) and continuously rising food prices, high unemployment and limited agricultural production (Heslot, 2014). In Isfahan, where the study was conducted, food insecurity has been reported as prevalent amongst its households

(Mohammadzadeh et al. 2010). However, most participants' in this study rarely reported to struggle to buy food, yet calculations based on income and food cost found that between 57-80% of total income was spent on food, clearly indicating massive food insecurity within this population. Therefore any nutritional intervention needs to take this into account and ensure feasibility in terms of affordability.

Currently the main type of rice available in the market is polished white rice and brown rice is not readily available except perhaps in some small speciality food shops in little packages at high prices. However, as rice is grown in Iran, there is a potential to produce brown rice for local consumption, which is a less labour intensive process and in theory brown rice should cost the same or less to buy. Therefore, brown rice substitution for white rice could be a feasible and affordable way to improve dietary carbohydrate quality in the diet of Iranians especially in food-insecure households.

#### 2.6.1 Study Limitations

Although, this was an explorative study to inform potential future larger intervention studies the sample size was relatively small and not necessarily representative of the Iranian population. Survey questionnaires can lead to 'social desirability bias' where respondents give socially desirable answers instead of choosing responses that are reflective of their own opinions. Although, bias cannot be completely eliminated it was prevented as much as possible by designing questions with an 'opt-out-choice' and reassuring participants throughout the survey that responses will remain anonymous and confidential. A positive control would have been useful as it would have been more informing in terms of cultural acceptability to compare likability ratings of brown

rice dishes with traditional white dishes. Some survey questions could have been eliminated or less questions asked on a particular topic, for instance questions 8 and 9 in diet-disease awareness section (Survey 2B) were really repeats of previously asked questions. The researcher was not fluent in Farsi [although familiar with the culture], therefore there were communication challenges, and to overcome these challenges a translator was used during the study and all study materials were initially developed in English before being translated into Farsi for data collection, and then retranslated back to English for analysis.

## 2.7 Conclusions and Recommendations

The present results from this exploratory study suggest that brown rice replacement for white rice would be culturally acceptable in the diet of Iranians. Through taste testing adapted traditional rice dishes, increasing awareness of brown rice including its nutritive and health benefits in combination with a home cooking trial. Most participants and their families liked the taste, found it easy to cook and wanted to eat healthy food. The findings from this exploratory study demonstrate feasibility of a future larger dietary intervention study involving consumption of brown rice in Iran, as a dietary intervention to change the staple rice quality in Iran has the potential to improve population health and have an impact on obesity and reducing diet-related diseases such as T2DM.



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# Appendices

## Appendix 1: Ethical Approval from Tehran University of Medical Sciences, Tehran, Iran (TUMS)

Vice Chancellor for Research,  
Tehran University of Medical Sciences,  
Ghods St., Keshavarz Blvd,  
Tehran, 1417653761,  
I. R. Iran  
Phone: 0098 21 88987381-2  
Fax: 0098 21 88987382  
Email: [resdeputy@tums.ac.ir](mailto:resdeputy@tums.ac.ir)  
Web: [www.tums.ac.ir](http://www.tums.ac.ir)



In the name of God, the Beneficent, the Merciful

### Ethical Approval

**Title of Project: Perceptions of Introducing Brown Rice into the Diet of Iranians  
in Lenjan County, Isfahan, Iran.**

**Ethics Approval Code: 130/2178**

**Project Number: -**

**Principal Investigator: Angela Branningan**

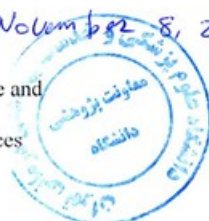
**Approval Date: 2015/11/07**

The Ethics Committee of Tehran University of Medical Sciences has approved the project in accordance with the tenets of the Helsinki Declaration and the national ethical guideline for medical research. Approval is granted on the conditions outlined below.

- Approval is given for three years. Projects, which have not commenced within two years of original approval, must be re-submitted to the Ethics Committee.
- Prior approval from the Ethics Committee is required before implementing any changes in the consent documents or any changes in the protocol unless those changes are required urgently for the subjects.
- You must complete and return the final report form when your research is completed.

The project is attached to this certificate.

*M. Yunesian*      *November 8, 2015*  
**Masud Yunesian, MD PhD**  
General Secretary, Ethics Committee and  
Vice Chancellor for Research  
Tehran University of Medical Sciences





**Appendix 2:** Participant information Sheet (English version)

## Exploring the possibility of introducing a new type of rice in Lenjan

## Participant Information Sheet

You are invited to take part in a research survey exploring the possibility of introducing a new type of rice in Lenjan, Isfahan, Iran. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

**What is the purpose of this study?**

To determine whether a new kind of rice could be introduced in Lenjan, Isfahan, Iran by asking local women their views and opinions on this new rice.

**Why have I been invited?**

You have been invited to take part in the study because you are an adult woman, who cooks and eats rice and lives in Lenjan.

**Do I have to take part?**

Participation in this study is purely voluntary; therefore it is up to you to decide whether or not to take part. If you decide to take part you will be given this information sheet to keep and be asked to sign a consent form. You may also withdraw from the study at any time without giving a reason.

**What will happen to me if I take part?**

If you decide to take part, you will be asked to attend two sessions at a study venue, complete three anonymous questionnaires, taste some rice dishes and take a free sample bag of rice home to cook for one week. The first session will last approximately 3.5 hours; you will be served refreshments and dinner where you will be asked to taste different rice dishes. You will be asked to complete two questionnaires; the first one will be administered before dinner, and will ask you some questions on your eating habits and diet knowledge, the second, after dinner will ask for your opinions on the rice dishes you tasted for dinner as well as some questions about yourself. You will be then asked if

you would like to take a free sample bag of rice home and cook it for your family for one week and come back the following week to share your experiences. If you decide to continue with the study the second session will last approximately 1.5 hours and you will be served refreshments. You will be asked to complete a third questionnaire about the rice sample you took home.

### **What are the possible disadvantages and risks of taking part?**

There are no anticipated disadvantages or risks foreseen in taking part in the study.

### **What are the possible benefits of taking part?**

Participants will gain knowledge about the importance of eating a healthy diet, receive and share recipes, receive a free sample bag of rice to take home and cook and meet with other local women. This research survey will help to increase community awareness about the role of rice in nutrition and may aid in development of public health nutrition interventions about amount and types of rice used in Iran.

### **What if something goes wrong?**

If you wish to complain or have any concerns about any aspect of the way you have been approached or treated during the course of this study, you may either contact The Dean of the Faculty of Life Sciences, University of Chester, Parkgate Road, Chester, CH1 4B1, UK, telephone +44 (0) 1244 513055 or Vice Chancellor for Research, Tehran University of Medical Sciences, Ghods Street, Keshavarz Boulevard, Tehran, Iran, telephone 0098 21 88987381-2.

### **Will my taking part in the study be kept confidential?**

All information, which is collected about you during the course of the research, will be kept strictly confidential in a secure database so that only the researchers carrying out the study, will have access to such information. Furthermore, the information will be used in a way that will not allow any one to be able to identify you individually.

### **What will happen to the results of the research study?**

The results will be analysed and written up into a research dissertation (MSc Public Health Nutrition), and possibly submitted for publication to a scientific journal. Individuals who participate will not be identified in any subsequent report or publication.

### Who may I contact for further information?

This research study is being organised and funded by Angela Brannigan, as part fulfilment of a Masters Degree in Public Health Nutrition at the University of Chester, UK.

If you would like more information about the research before you decide whether or not you would be willing to take part, you may contact either:

Dr Ali Rajabi Siahboomi (Farsi speaking)

Telephone: +1 267 210 4868

Email: [asiahboomi@colorcon.com](mailto:asiahboomi@colorcon.com)

Angela Brannigan (English speaking)

University of Chester

Telephone: +1 267 638 8458

Email: [1429078@chester.ac.uk](mailto:1429078@chester.ac.uk)

Thank you for your interest in this research study

## داوطلبان

### بررسی امکان معرفی برنج جدیدی در لنجان

از شما دعوت می شود در یک طرح پژوهشی با عنوان بررسی امکان معرفی برنج جدیدی در لنجان شرکت کنید. قبل از تصمیم گیری، لازم است که شما دلیل انجام شدن این پژوهش و همچنین اهداف آن را بدانید. لطفاً با حوصله و با دقت اطلاعات زیر را بخوانید و اگر لازم باشد با افراد دیگر مشورت کنید. اگر چیزی واضح نیست یا اطلاعات بیشتری می خواهید لطفاً سوال کنید. لطفاً با حوصله تصمیم داوطلبانه خود را اعلام کنید.

#### هدف از این مطالعه چیست؟

از طریق بررسی دیدگاه ها و ، برای تعیین اینکه آیا یک نوع جدید از برنج می تواند در لنجان معرفی شود نظرات بانوان محلی درمورد این برنج جدید.

#### چرا من دعوت شده ام؟

از شما برای شرکت در این مطالعه دعوت می شود به دلیل اینکه شما یک بانویی هستید که در لنجان زندگی می کنید و برنج می پزید و می خورید.

#### آیا من مجبورم در این مطالعه شرکت کنم؟

مشارکت در این مطالعه کاملاً داوطلبانه است و بنابراین شرکت در این مطالعه وابسته به تصمیم شماست. اگر شما تصمیم به شرکت در مطالعه گرفتید اطلاعات مربوط به پژوهش به شما داده می شود و همچنین شما بابتی فرم رضایت شرکت کنندگان را امضاء کنید. همچنین در هر زمان شما می توانید از مطالعه بدون هیچ دلیلی انصراف بدهید.

#### چه اتفاقی برای من می افتد اگر در این پژوهش شرکت کنم؟

اگر شما تصمیم گرفتید در این پژوهش شرکت کنید، از شما خواسته خواهد شد تا در دو جلسه در یک محل مطالعه حضور یابید، سه پرسشنامه را بدون نام کامل کنید، برخی از غذاهای برنجی را بچشید و یک کیسه برنج نمونه رایگان را با خود برده و آنرا برای یک هفته بپزید. اولین جلسه حدود 3/5 ساعت به طول خواهد انجامید. در این زمان از شما به صرف ناهار با برنج های مختلف پذیرایی می شود.. از شما درخواست خواهد شد که دو پرسشنامه را جواب دهید؛ یکی قبل از ناهار در مورد عادات غذا خوردن و دانش رژیم غذایی، و یکی بعد از ناهار، در مورد نظراتان راجع به طعم برنجهای خورده شده و همچنین چند سوال در مورد خود شما. بعد از آن از شما درخواست خواهد شد اگر مایلید یک کیسه برنج نمونه رایگان را به خانه برده و آن را به مدت یک هفته برای خانواده خود بپزید و تجربیات خود را با ما به اشتراک بگذارید. اگر شما تصمیم به ادامه حضور در این مطالعه را گرفتید، جلسه دوم حدود 1/5 ساعت طول خواهد کشید و از شما پذیرایی خواهد شد. از شما درخواست خواهد شد تا پرسشنامه سوم را در مورد برنج نمونه کامل کنید.

#### ضررها و خطرات احتمالی شرکت در این پژوهش چیست؟

هیچ ضرر و یا خطرات پیش بینی شده در این پژوهش وجود ندارد.

#### فواید احتمالی شرکت در این پژوهش چیست؟

شرکت کنندگان در مورد اهمیت داشتن یک رژیم غذایی سالم اطلاعات به دست می آورند، دستور العمل های غذایی را به اشتراک می گذارند، یک کیسه نمونه رایگان از برنج را دریافت می کنند و با بانوان دیگر محلی آشنا می شوند. این پژوهش به افزایش آگاهی جامعه در مورد نقش برنج در تغذیه کمک خواهد کرد و ممکن است

در توسعه مداخلات تغذیه ایی برای افزایش سلامت جامعه در مورد مقدار و نوع برنج مورد استفاده در ایران کمک کند.

### اگر چیزی اشتباه شد چه می شود؟

اگر شما شکایت و یا هر گونه نگرانی در مورد نوع برخورد با شما در طول مدت مطالعه داشتید ، شما می توانید با رئیس دانشکده علوم، دانشگاه چستر در بریتانیا به آدرس زیر تماس بگیرید:

The Dean of the Faculty of Life Sciences, University of Chester, Parkgate Road,  
Chester, CH1 4B1, UK, Telephone: +44 1244513055

### آیا شرکت کردن من در مطالعه محرمانه خواهد بود ؟

تمام اطلاعاتی که در مورد شما در طول این دوره از تحقیقات جمع آوری خواهد شد به طور کامل محرمانه خواهد بود و در یک محل امن نگه داشته می شوند و تنها محققان این مطالعه دسترسی به این اطلاعات را خواهند داشت. علاوه بر این، اطلاعات به گونه ایی گرفته خواهد شد که هیچ کس قادر به شناسایی شما به طور جداگانه نخواهد بود.

### نتایج حاصل از این پژوهش چه خواهد شد؟

نتایج تجزیه و تحلیل خواهد شد و به صورت یک پایان نامه تحقیقاتی (کارشناسی ارشد تغذیه بهداشت عمومی) نوشته خواهد شد، و احتمالاً برای چاپ در یک مجله علمی ارسال خواهد شد. افرادی که در این مطالعه شرکت می کنند در هیچ کدام از مراحل گزارش پایان نامه و یا چاپ در مجله علمی شناسایی نخواهند شد.

### تامین بودجه و ساماندهی این پژوهش با چه کسی است؟

این تحقیق، به عنوان پروژه برای مدرک کارشناسی ارشد در تغذیه عمومی در دانشگاه چستر، انگلستان، توسط آنجلا برانینگان سازمان یافته و تامین بودجه می شود.

### برای کسب اطلاعات بیشتر با کجا تماس بگیریم؟

قبل از تصمیم گیری، اگر تمایل به کسب اطلاعات بیشتر در مورد این پژوهش دارید ، شما می توانید با هر کدام از روش های زیر با ما در تماس باشید:

آنجلا برانینگان

چستر، انگلستان دانشگاه

001 267 638 8458 تلفن:

ایمیل: [1429078@chester.ac.uk](mailto:1429078@chester.ac.uk)

متشکرم برای علاقه و شرکت شما در این تحقیق

---

**Appendix 3:** Participant consent form (English version)

---

**Project Title:** Exploring the possibility of introducing a new type of rice in Lenjan, Isfahan, Iran

**Name of Researcher:** Angela Brannigan

Please initial each box

I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions.

☐

I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason and without my legal rights being affected.

☐

I agree to take part in the above study

☐

Participant's Name: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Researcher's Name: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## Participant consent form (Farsi version)

University of  
Chester

## فرم رضایت شرکت کنندگان

عنوان پروژه: بررسی امکان معرفی نوع جدیدی از برنج در لنجان اصفهان، ایران

نام و نام خانوادگی محقق: آنجلا برانیگان

لطفا هر جعبه (☐) را تیک بزنید

۱. من تایید می کنم که اطلاعات مربوط به پروژه ی فوق را خوانده و درک کرده ام و همچنین فرصت برای پرسیدن هر سؤالی را داشته ام.

☐

۲. من می دانم که شرکت من داوطلبانه است و می توانم در هر زمان بدون هیچ دلیلی پژوهش را ترک کنم بدون اینکه حقوق قانونی من تحت تأثیر قرار گیرد.

☐

۳. من برای شرکت در مطالعه ی فوق موافق هستم.

☐

نام شرکت کننده: .....

امضا: ..... تاریخ: .....

نام محقق: .....

امضا: ..... تاریخ: .....

**Appendix 4:** Recruitment flyer (English version)



## Female volunteers needed For dietary survey

December 13<sup>th</sup> and 19<sup>th</sup> 2015

Are you over 18?

***Do you cook and eat rice?***

Live in Lenjan

You are invited to participate in a research survey exploring the possibility of introducing a new type of rice in Lenjan

If you are interested in participating or would like further information please contact Angela Brannigan +1 ### ### ####



Recruitment Flyer (Farsi)



به تعدادی بانو داوطلب برای شرکت در یک  
پژوهش در مورد برنج مورد نیاز است.

۲۲ آذر سال ۱۳۹۴

آیا سن شما بالای ۱۸ سال است؟

**آیا شما برنج می پزید و می خورید؟**

شما در لنجان زندگی می کنید؟

اگر مایل به شرکت در این پژوهش هستید و با اطلاعات بیشتری می خواهید با  
شماره ۰۹۱۳۲۳۷۴۱۰۵ تماس بگیرید.

## Appendix 5: Survey Questionnaires



University of  
Chester

Please complete the following Survey as accurately and honestly as possible, all answers will be kept anonymous and confidential. *In this section we would like to ask you some questions about your eating habits.* Please put a tick ☒ in the box next to the answer of your choice or write your answer in the space provided as the case may be. If you are unsure what the question means please ask for assistance. Thank you for your time, it is greatly appreciated.

Participation Number:

Group Number:

Location: Mobarak

Lead Researcher:  
Angela Brannigan

Date:

Time: 5pm

### 1. How often do you eat breakfast, lunch, and dinner?

	Breakfast	Lunch	Dinner
Every day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Most days	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sometimes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rarely	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Never	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### 1a. On average what time do you eat your meals?

Breakfast: \_\_\_\_\_

Lunch: \_\_\_\_\_

Dinner: \_\_\_\_\_

## 1b. Do you have snacks between meals during the day?

	Between breakfast & lunch	Between lunch & dinner	After dinner
Every day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Most days	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sometimes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rarely	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Never	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## 2. Do you nap or go to sleep after eating?

	Breakfast	Lunch	Dinner
Every day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Most days	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sometimes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rarely	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Never	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### 3. Please tick which of the following rice dishes you cook and indicate how often you cook them.

Rice dishes	Often	Sometimes	Special Occasions	Rarely	Never
Plain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Baked	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
With dill	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
With cabbage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
With green beans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
With kidney beans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
With black-eyed beans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
With tomatoes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
With barberries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
With sour cherries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
With lentils	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
With carrots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
With broad beans and dill	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
With cauliflower and herbs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
With raisins	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
With dates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
With prawns	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
With meatballs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Baked with fish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Baked with meat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Soup	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stuffed vine leaves	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stuffed green peppers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stuffed aubergine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Porridge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Puffed rice (desert)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rice cookies (desert)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### 4. How often do you eat rice?

	Breakfast	Lunch	Dinner
Every day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Most days	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Few times a week	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Once a week	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Few times a month	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Once a month	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Occasionally	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rarely	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Never	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### 5. Looking at the 6 plates of rice, please indicate which rice plate (1 – 6) resembles the amount of rice you have on average for breakfast, lunch and dinner.

<input type="checkbox"/>	Breakfast	<input type="checkbox"/>	Lunch	<input type="checkbox"/>	Dinner
--------------------------	-----------	--------------------------	-------	--------------------------	--------

#### 6. Do you know what brown rice is?

☐ No
 ☐ Not sure
 ☐ Yes

6a. Tick the box, which you think best describes brown rice.

---

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> A specially grown rice | <input type="checkbox"/> Inedible or not ready rice | <input type="checkbox"/> Dirty or unclean rice |
| <input type="checkbox"/> Dyed or coloured rice  | <input type="checkbox"/> Unpolished rice            | <input type="checkbox"/> Whole grain food      |
| <input type="checkbox"/> Don't know             |   |  |

7. Have you ever eaten brown rice?

---

- |                             |                                   |                              |
|-----------------------------|-----------------------------------|------------------------------|
| <input type="checkbox"/> No | <input type="checkbox"/> Not sure | <input type="checkbox"/> Yes |
|-----------------------------|-----------------------------------|------------------------------|

7a. If yes, did you like the taste of it? *(do not answer if never tasted brown rice)*

---

- |                             |                                   |   |                              |
|-----------------------------|-----------------------------------|---|------------------------------|
| <input type="checkbox"/> No | <input type="checkbox"/> A little | <input type="checkbox"/> Can't remember | <input type="checkbox"/> Yes |
|-----------------------------|-----------------------------------|---|------------------------------|

7b. If you answered yes to question 7, how often have you eaten brown rice? *(do not answer if never tasted brown rice)*

---

- |  |                                      |   |                                       |
|--|--------------------------------------|---|---------------------------------------|
| <input type="checkbox"/> Just tasted it once | <input type="checkbox"/> Rarely      | <input type="checkbox"/> Occasionally     | <input type="checkbox"/> Once a month |
| <input type="checkbox"/> Few times a month   | <input type="checkbox"/> Once a week | <input type="checkbox"/> Few times a week | <input type="checkbox"/> Most days    |

Thank you very much for taking the time to complete this survey. Your feedback is valued and very much appreciated!



Please complete the following Survey as accurately and honestly as possible, all answers will be kept anonymous and confidential. *In this section we would like to ask you some questions about health and food.* Please put a tick ☒ in the box next to the answer of your choice or write your answer in the space provided as the case may be. If you are unsure what the question means please ask for assistance. Thank you for your time, it is greatly appreciated.

Participation Number:

Group Number:

Location: Mobarak, Iran

Lead Researcher:

Date:

Time: 5 pm

Angela Brannigan

---

**1. Do you think the food that you eat, affects your health and wellbeing?**

---

☐ No ☐ Not sure ☐ Yes

---

**2. Are you aware of the difference between whole grains and refined grains?**

---

☐ No ☐ Not sure ☐ Yes

---

**3. Are you aware of any major health problems or diseases that are related to a low intake of fruit and vegetables?**

---

☐ No ☐ Not sure ☐ Yes

3a. If yes, what diseases or health problems do you think are related to a low intake of fruit and vegetables?

---

---

---

**4. Are you aware of any major health problems or diseases that are related to a low intake of fibre?**

☐ No ☐ Not sure ☐ Yes

4a. If yes, what diseases or health problems do you think are related to a low intake of fibre?

---

---

---

**5. Are you aware of any major health problems or diseases that are related to how much sugar people eat?**

☐ No ☐ Not sure ☐ Yes

5a. If yes, what diseases or health problems do you think are related to sugar?

---

---

---

**6. Are you aware of any major health problems or diseases that are related to how much salt people eat?**

☐ No ☐ Not sure ☐ Yes



6a. If yes, what diseases or health problems do you think are related to salt?

---



---



---

**7. Are you aware of any major health problems or diseases that are related to the amount of fat people eat?**

☐ No ☐ Not sure ☐ Yes

6a. If yes, what diseases or health problems do you think are related to the amount of fat people eat?

---



---



---

**8. Do you think these help to reduce the chances of getting certain kinds of cancer?**

*(please answer each one)*

	No	Not sure	Yes
Eating more fibre	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating less sugar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating less fat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating less salt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating more fruit & vegetables	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating less preservatives/additives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**9. Do you think these help prevent heart disease?***(please answer each one)*

	No	Not sure	Yes
Eating more fibre	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating less sugar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating less fat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating less salt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating more fruit & vegetables	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating less preservatives/additives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Thank you very much for taking the time to complete this survey. Your feedback is valued and very much appreciated!



Please complete the following Survey as accurately and honestly as possible, all answers will be kept anonymous and confidential. *In this section we would like to ask you some questions about the lunch you were served today.* Please put a tick ☒ in the box next to the answer of your choice. If you are unsure what the question means please ask for assistance. Thank you for your time, it is greatly appreciated.

Participation Number:

Group Number:

Location: Mobarak, Iran

Lead Researcher:  
Angela Brannigan

Date:

Time: 5 pm

### 1. Overall, how much did you like or dislike the brown rice that was served for lunch today?

☐ Like very much    ☐ Like a little    ☐ Not sure    ☐ Dislike a little    ☐ Dislike very much

1a. How much did you like or dislike the flavour of the brown rice?

☐ Like very much    ☐ Like a little    ☐ Not sure    ☐ Dislike a little    ☐ Dislike very much

1b. How much did you like or dislike the texture of the brown rice?

☐ Like very much    ☐ Like a little    ☐ Not sure    ☐ Dislike a little    ☐ Dislike very much

1c. How much did you like or dislike the appearance of the brown rice?

☐ Like very much    ☐ Like a little    ☐ Not sure    ☐ Dislike a little    ☐ Dislike very much

1d. How much did you like or dislike the smell of brown rice?

☐ Like very much    ☐ Like a little    ☐ Not sure    ☐ Dislike a little    ☐ Dislike very much

---

**2. Now that you have heard about the benefits of eating brown rice and tasted it, how likely or unlikely are you to eat brown rice again?**

---

☐ Very likely      ☐ Likely      ☐ Not sure      ☐ Unlikely      ☐ Very unlikely

**3. If available locally, how likely are you to purchase and cook brown rice for your family?**

---

☐ Very likely      ☐ Likely      ☐ Not sure      ☐ Unlikely      ☐ Very unlikely

**3a. How often do you think you would cook brown rice for your family?**

---

☐ Every day      ☐ Few times a week      ☐ Weekly      ☐ Twice a month

☐ Monthly      ☐ Rarely      ☐ Not sure      ☐ Never

**4. How likely or unlikely are you to recommend eating brown rice to family and friends?**

---

☐ Very likely      ☐ Likely      ☐ Not sure      ☐ Unlikely      ☐ Very unlikely

**5. Are you prepared to take home a sample bag of brown rice and cook it for your family for one week (3 times) and come back the next week and tell us how you got on?**

---

☐ Yes      ☐ Not sure (tell me more)      ☐ No

Thank you very much for taking the time to complete this survey. Your feedback is valued and very much appreciated!



Please complete the following Survey as accurately and honestly as possible, all answers will be kept anonymous and confidential. *In this section we would like to ask you some questions about yourself and your family.* Please put a tick ☒ in the box next to the answer of your choice or write your answer in the space provided as the case may be. If you are unsure what the question means please ask for assistance. Thank you for your time, it is greatly appreciated.

Participation Number:

Group Number:

Location: Mobarak, Iran

Lead Researcher:  
Angela Brannigan

Date:

Time: 5 pm

### 1. How old are you?

- |                                  |                                  |                                  |                                       |
|----------------------------------|----------------------------------|----------------------------------|---------------------------------------|
| <input type="checkbox"/> 18 - 24 | <input type="checkbox"/> 25 - 34 | <input type="checkbox"/> 35 - 44 | <input type="checkbox"/> 45 - 54      |
| <input type="checkbox"/> 55 - 64 | <input type="checkbox"/> 65 - 74 | <input type="checkbox"/> 75 - 84 | <input type="checkbox"/> More than 85 |

#### 1a. Are you:

- |                                 |                                  |                                   |                                  |
|---------------------------------|----------------------------------|-----------------------------------|----------------------------------|
| <input type="checkbox"/> Single | <input type="checkbox"/> Married | <input type="checkbox"/> Divorced | <input type="checkbox"/> Widowed |
|---------------------------------|----------------------------------|-----------------------------------|----------------------------------|

### 2. Do you have children?

- |                             |                              |
|-----------------------------|------------------------------|
| <input type="checkbox"/> No | <input type="checkbox"/> Yes |
|-----------------------------|------------------------------|

2a. If yes, please specify number of children in each age range. *(Leave blank if no children)*

- |                                   |                                    |                                     |                                     |
|-----------------------------------|------------------------------------|-------------------------------------|-------------------------------------|
| <input type="checkbox"/> 0 - 5yrs | <input type="checkbox"/> 6 - 11yrs | <input type="checkbox"/> 12 - 18yrs | <input type="checkbox"/> Over 18yrs |
|-----------------------------------|------------------------------------|-------------------------------------|-------------------------------------|

## 2b. How many people live in your household? *(Include yourself in the answer)*

	1	2	3	4	5	6	6+
Adults (over 18)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Children (under18)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## 3. What level of schooling did you reach?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
No schooling	Primary	Middle	Secondary	Pre-University	University

## 4. Are you employed?

<input type="checkbox"/> Yes	<input type="checkbox"/> Part Time	<input type="checkbox"/> Full Time
<input type="checkbox"/> No but I am looking	<input type="checkbox"/> No I am a Homemaker	

## 5. What is your family's monthly income (in Toman)?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Less than 699,99	700,000 – 999, 999	1, 000,000 – 1,999,999	2, 000,000 – 4, 999,999
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5, 000,000 – 9, 999,999	More than 10, 000,000	Don't know	

## 6. On average how much do you spend on food per week?

Weekly cost of food: \_\_\_\_\_

### 6a. Do you ever struggle to afford to buy the food you need?

<input type="checkbox"/> Never	<input type="checkbox"/> Rarely	<input type="checkbox"/> Sometimes	<input type="checkbox"/> Often	<input type="checkbox"/> All the time
--------------------------------	---------------------------------	------------------------------------	--------------------------------	---------------------------------------

### 6b. Are you always able to find the food you need in the shops?

<input type="checkbox"/> Never	<input type="checkbox"/> Rarely	<input type="checkbox"/> Sometimes	<input type="checkbox"/> Often	<input type="checkbox"/> All the time
--------------------------------	---------------------------------	------------------------------------	--------------------------------	---------------------------------------

---

**7. How would you rate your overall health?**

---

- ☐ Excellent      ☐ Very good      ☐ Good      ☐ Fair      ☐ Poor

---

**7a. Do you have any of the following health conditions? (*Tick all that apply*)**

---

- ☐ High blood pressure      ☐ Heart disease      ☐ Diabetes      ☐ Arthritis      ☐ Osteoporosis
- ☐ Respiratory diseases      ☐ Stroke      ☐ Kidney disease      ☐ Liver disease      ☐ Cancer
- ☐ None      ☐ Other (please specify) \_\_\_\_\_

---

**7b. Does any one in your immediate family (living in same household) have any health conditions?**

---

- ☐ No      ☐ Yes

---

**7c. If yes, tick which health conditions do they have? (*Tick all that apply*)**

---

*(Do not answer if family members are healthy)*

---

- ☐ High blood pressure      ☐ Heart disease      ☐ Diabetes      ☐ Arthritis      ☐ Osteoporosis
- ☐ Respiratory diseases      ☐ Stroke      ☐ Kidney disease      ☐ Liver disease      ☐ Cancer
- ☐ None      ☐ Other (please specify) \_\_\_\_\_

Thank you very much for taking the time to complete this survey. Your feedback is valued and very much appreciated!



Please complete the following Survey as accurately as possible, your responses will remain private and confidential. *In this section we would like to ask you some questions about your experience in cooking and eating brown rice.* Please put a tick ☒ in the box next to the answer of your choice or write your answer in the space provided as the case may be. If you are unsure what the question means please ask for assistance. Thank you for your time, it is greatly appreciated.

Participation Number:

Group Number:

Location:

Lead Researcher:  
Angela Brannigan

Date:

Time:

### 1. During this past week how often did you cook and serve the brown rice?

☐ 0    ☐ 1    ☐ 2    ☐ 3    ☐ 4    ☐ 5    ☐ 6    ☐ 6+

### 2. Did other family members eat or taste the brown rice you cooked and served?

☐ Yes (everybody)    ☐ Yes (some)    ☐ No

### 3. Did you encounter any problems cooking the brown rice?

☐ No    ☐ A little    ☐ Yes

Comments?



3a. Overall, how happy were you with how your brown rice dishes turned out?

- ☐ Happy ☐ Somewhat happy ☐ Not happy

Comments? \_\_\_\_\_

**4. Overall, how much did you like or dislike eating brown rice, now that you have cooked and eaten it for one week?**

- ☐ Like very much ☐ Like a little ☐ Not sure ☐ Dislike a little ☐ Dislike very much

4a. How much did you like or dislike the flavour of the brown rice you cooked?

- ☐ Like very much ☐ Like a little ☐ Not sure ☐ Dislike a little ☐ Dislike very much

4b. How much did you like or dislike the texture of the brown rice you cooked?

- ☐ Like very much ☐ Like a little ☐ Not sure ☐ Dislike a little ☐ Dislike very much

4c. How much did you like or dislike the appearance of the brown rice you cooked?

- ☐ Like very much ☐ Like a little ☐ Not sure ☐ Dislike a little ☐ Dislike very much

4d. How much did you like or dislike the smell of brown rice you cooked?

- ☐ Like very much ☐ Like a little ☐ Not sure ☐ Dislike a little ☐ Dislike very much

**5. How about your family, did they like or dislike the brown rice you cooked and served them?**

- |  |   |
|--|---|
| <input type="checkbox"/> It was mixed, some did, some didn't | <input type="checkbox"/> It depended on how I cooked it |
| <input type="checkbox"/> Yes everybody liked it              | <input type="checkbox"/> They somewhat liked it         |
| <input type="checkbox"/> Neither liked it or disliked it     | <input type="checkbox"/> Didn't like it                 |

Comments? \_\_\_\_\_

**6. Now that you know the benefits of eating brown rice, have cooked and eaten it for one week, how likely or unlikely are you to continue to eat brown rice?**

☐ Very likely    ☐ Likely    ☐ Not sure    ☐ Unlikely    ☐ Very unlikely

Comments? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**7. If available locally, how likely are you to purchase and cook brown rice for your family?**

☐ Very likely    ☐ Likely    ☐ Not sure    ☐ Unlikely    ☐ Very unlikely

**7a. How often do you think you would cook brown rice for your family?**

☐ Every day    ☐ Few times a week    ☐ Weekly    ☐ Twice a month

☐ Monthly    ☐ Rarely    ☐ Not sure    ☐ Never

Comments? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**8. How likely or unlikely are you to recommend eating brown rice to family and friends?**

☐ Very likely    ☐ Likely    ☐ Not sure    ☐ Unlikely    ☐ Very unlikely

Thank you very much for taking the time to complete this survey. Your feedback is valued and very much appreciated!

## Appendix 5: Survey Questionnaires



University of  
Chester

دقت و صحت کامل کنید، پاسخ های شما محرمانه خواهد بود. در این قسمت ما لطفا پرسشنامه زیر را با می خواهیم چند سوال در مورد عادات غذا خوردن شما بپرسیم. لطفا پاسخ خود را با علامت تیک درون مشخص کنید. اگر چیزی از سوال را متوجه نشدید لطفا از ما کمک بخواهید. با سپاس فراوان ☒ مربع از اینکه وقتتان را برای ما گذاشتید.

مکان:

شماره گروه:

شماره داوطلب:

زمان:

تاریخ:

: پژوهشگر

آنچلا برانیگان

۱. هر چند وقت یکبار شما صبحانه، ناهار و شام میخورید؟

هرگز

به ندرت

گاهی اوقات

بیشتر روز ها

هر روز

☐
☐
☐
☐
☐

صبحانه

☐
☐
☐
☐
☐

ناهار

☐
☐
☐
☐
☐

شام

۱ الف . چه ساعتی شما به طور معمول وعده های غذایی خود را می خورید؟

صبحانه: .....

ناهار: .....

شام: .....

-

۱-ب. آیا شما تنقلات بین وعده های اصلی غذایی در طول روز می خورید؟

هرگز	به ندرت	گاهی اوقات	بیشتر روز ها	هر روز	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	بین صبحانه و ناهار
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	بین ناهار و شام
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	بعد شام

۲. آیا شما بعد از غذا خوردن چرت میزنید یا می خوابید؟

هرگز	به ندرت	گاهی اوقات	بیشتر روز ها	هر روز	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	صبحانه
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ناهار
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	شام

۳. لطفا با علامت تیک هر کدام از غذا های برنجی زیر را که می پزید انتخاب کنید و مشخص کنید چند دفعه این نوع برنج ها را طبخ می کنید.

غذا های برنجی	اغلب	گاهی اوقات	مناسبت های خاص	به ندرت	هرگز
ساده	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
دمپخت	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
با شوید	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
با کلم	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
با لوبیا سبز	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
با لوبیا قرمز	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
با لوبیا چشم بلبلی	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
با گوجه فرنگی	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
با زرشک	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
با آلبالو ترش	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
با عدس	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
با هویج	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
با باقالا و شوید	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
با گل کلم و سبزیجات	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
با کشمش	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
با خرما	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
با میگو	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
با کوفته	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
با ماهی	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
با گوشت	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
سوپ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
دلمه برگ انگور	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
دلمه فلفل سبز	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
بادمجان شکم پر	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
فرنی	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
برنجک/برنج پوک	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

۴. شما هر چند وقت یکبار برنج می خورید؟

هرگز	به ندرت	یک بار در ماه	گاهی اوقات در ماه	یک بار در هفته	گاهی اوقات در هفته	هر روز	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	صبحانه
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ناهار
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	شام

۵. به تصاویر ۱ تا ۶ نگاه کنید کدام عکس (۱ تا ۶) شبیه به مقدار برنج مصرفی شما در صبحانه، ناهار و شام است؟

<input type="checkbox"/>	صبحانه	<input type="checkbox"/>	ناهار	<input type="checkbox"/>	شام
--------------------------	--------	--------------------------	-------	--------------------------	-----

۶. آیا می دانید برنج قهوه ای چیست؟

<input type="checkbox"/>	بله	<input type="checkbox"/>	مطمئن نیستم	<input type="checkbox"/>	خیر
--------------------------	-----	--------------------------	-------------	--------------------------	-----

۶ الف. با علامت تیک بهترین توصیف برای برنج قهوه ای را انتخاب کنید؟

<input type="checkbox"/>	برنجی که در شرایط خاص رشد یافته	<input type="checkbox"/>	برنج نارس و غیر قابل خوردن	<input type="checkbox"/>	برنج کثیف
<input type="checkbox"/>	برنج رنگ شده	<input type="checkbox"/>	برنج سفید نشده	<input type="checkbox"/>	غلات کامل
<input type="checkbox"/>	مطمئن نیستم				

۷. آیا تا به حال برنج قهوه ای خورده اید؟

☐ خیر ☐ مطمئن نیستم ☐ بله

۷ الف. اگر بله، طعم برنج قهوه ای را دوست داشتید (کسانی که برنج قهوه ای نخورده اند جواب ندهند)

☐ خیر ☐ کمی ☐ یادم نمیاد ☐ بله

۷ ب. اگر پاسخ شما به سوال ۷ بله است، هر چند وقت یکبار برنج قهوه ای می خورید ؟ (کسانی برنج قهوه ای نخورده اند پاسخ ندهند)

☐ فقط یک بار آن را تست کرده ☐ به ندرت ☐ گاهی اوقات ☐ ماهی یک بار

☐ چند بار در ماه ☐ یک بار در هفته ☐ چند بار در هفته ☐ بیشتر روزها

از اینکه برای پر کردن پرسشنامه وقت گذاشتید از شما بسیار سپاسگزارم. نظرات شما با ارزش می باشد و بسیار قدردانیم .

University of  
Chester

## Survey One: Section B

دقت و صحت کامل کنید، پاسخ های شما محرمانه خواهد بود. در این قسمت ما می لطفا پرسشنامه زیر را با خواهیم چند سوال در مورد غذا و سلامت از شما بپرسیم. لطفا پاسخ خود را با علامت تیک درون مربع مشخص کنید. اگر سوالی را متوجه نشدید لطفا از ما کمک بخواهید. با سپاس فراوان از اینکه وقتتان را ☒ برای ما گذاشتید.

مکان:

شماره گروه:

شماره داوطلب:

زمان:

تاریخ:

پژوهشگر:

آنچلا برانیگان

۱. آیا شما فکر می کنید که مواد غذایی که شما می خورید تاثیری بر سلامت و تندرستی شما دارد؟

☐ بله☐ مطمئن نیستم☐ خیر

۲. آیا شما از تفاوت بین غلات کامل و غلات تصفیه شده آگاه هستید؟

☐ بله☐ مطمئن نیستم☐ خیر



۳. آیا شما از هر گونه مشکلات بهداشتی عمده و یا بیماری هایی که مرتبط با دریافت کم میوه و سبزیجات می باشد آگاه هستید؟

☐ خیر ☐ مطمئن نیستم ☐ بله

۳الف. اگر بله، فکر می کنید چه بیماری ها و یا مشکلات بهداشتی با مصرف کم میوه و سبزیجات مربوط است؟

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.....

.....

۴. آیا شما از هر گونه مشکلات بهداشتی عمده و یا بیماری هایی که با مصرف کم فیبر مرتبط هستند، آگاه هستید؟

☐ خیر ☐ مطمئن نیستم ☐ بله

۴الف. اگر بله، فکر می کنید چه بیماری ها و یا مشکلات بهداشتی با مصرف کم فیبر مرتبط هستند؟

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.....

۵. آیا شما از هر گونه مشکلات بهداشتی عمده و یا بیماری هایی که با مقدار خوردن قند مرتبط هستند، آگاه هستید؟

☐ بله ☐ مطمئن نیستم ☐ خیر

۵الف. اگر بله، فکر می‌کنید چه بیماری‌هایی با مصرف قند در ارتباط هستند؟

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.....

۶. آیا شما از هر گونه مشکلات بهداشتی عمده و یا بیماری‌هایی که با مقدار دریافت نمک مرتبط هستند، آگاه هستید؟

☐ بله ☐ مطمئن نیستم ☐ خیر

۶الف. اگر بله، فکر می‌کنید چه بیماری‌ها یا مشکلات سلامتی با مصرف نمک مرتبط هستند؟

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۷. آیا شما از هر گونه مشکلات بهداشتی عمده و یا بیماری‌هایی که با مقدار دریافت چربی ارتباط دارند، آگاه هستید؟

☐ بله ☐ مطمئن نیستم ☐ خیر

، فکر می کنید چه بیماری یا مشکلات سلامتی با مقدار مصرف چربی در ارتباط هستند؟ ۷ الف . اگر بله

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.....

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۸. آیا شما فکر می کنید موارد زیر شانس ابتلا به بعضی انواع سرطان ها را کاهش می دهند؟ (لطفا همه موارد را جواب دهید)

بله	مطمئن نیستم	خیر	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	خوردن فیبر بیشتر
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	خوردن قند کمتر
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	خوردن چربی کمتر
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	خوردن نمک کمتر
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	خوردن میوه ها و سبزیجات بیشتر
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	خوردن مواد نگهدارنده / مواد افزودنی کمتر

۹. آیا شما فکر می کنید موارد زیر شانس ابتلا به بیماری های قلبی را کاهش می دهند؟ (لطفا همه موارد را جواب دهید)

بله	مطمئن نیستم	خیر	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	خوردن فیبر بیشتر
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	خوردن قند کمتر
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	خوردن چربی کمتر
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	خوردن نمک کمتر
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	خوردن میوه ها و سبزیجات بیشتر
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	خوردن مواد نگهدارنده / مواد افزودنی کمتر

از اینکه برای تکمیل این پرسشنامه وقت گذاشتید از شما بسیار سپاسگزارم. نظرات شما با ارزش می باشد و بسیار قدر دانیم.



لطفا پرسشنامه زیر را با دقت و صحت کامل کنید، پاسخ های شما محرمانه خواهد بود. در این قسمت ما می خواهیم چند سوال در مورد ناهار امروز که برای شما سرو شد بپرسیم. لطفا پاسخ خود را با مشخص کنید. اگر چیزی از سوال را متوجه نشدید لطفا از ما کمک ☒ علامت تیک درون مربع بخواهید. با سپاس فراوان از اینکه وقتتان را برای ما گذاشتید.

مکان:

شماره گروه:

شماره داوطلب:

زمان:

تاریخ:

پژوهشگر:

آنچلا برانیگان

۱. به طور کلی، چقدر از برنج قهوه ای که امروز برای ناهار شما سرو شد خوشتان آمد؟

☐ خیلی خوشم آمد ☐ کمی خوشم آمد ☐ مطمئن نیستم ☐ کمی خوشم نیامد ☐ اصلا خوشم نیامد

الف. چقدر از طعم برنج قهوه ای خوشتان آمد؟

☐ خیلی خوشم آمد ☐ کمی خوشم آمد ☐ مطمئن نیستم ☐ کمی خوشم نیامد ☐ اصلا خوشم نیامد

ب. چقدر از بافت برنج قهوه ای خوشتان آمد؟

☐ خیلی خوشم آمد ☐ کمی خوشم آمد ☐ مطمئن نیستم ☐ کمی خوشم نیامد ☐ اصلا خوشم نیامد

۱. ج. چقدر از ظاهر برنج قهوه ای خوشتان آمد؟

☐ خیلی خوشم آمد ☐ کمی خوشم آمد ☐ مطمئن نیستم ☐ کمی خوشم نیامد ☐ اصلا خوشم نیامد

۱. د. چقدر از بوی برنج قهوه ای خوشتان آمد؟

☐ خیلی خوشم آمد ☐ کمی خوشم آمد ☐ مطمئن نیستم ☐ کمی خوشم نیامد ☐ اصلا خوشم نیامد

۲. در حال حاضر که شما در مورد مزایای خوردن برنج قهوه ای میدانید و طعم آن را چشیده اید، احتمال اینکه دوباره برنج قهوه ای بخورید چقدر است؟

☐ به احتمال بسیار زیاد ☐ احتمالا ☐ مطمئن نیستم ☐ بعید ☐ بسیار بعید است

۳. اگر برنج قهوه ایی در محل سکونت شما در دسترس باشد چقدر احتمال دارد که شما برنج قهوه ای را برای خانواده خود بخورید و بپزید؟

☐ به احتمال بسیار زیاد ☐ احتمالا ☐ مطمئن نیستم ☐ بعید ☐ بسیار بعید است

۳ الف. هر چند وقت یکبار شما فکر می کنید برای خانواده خود برنج قهوه ای بپزید؟

☐ هر روز ☐ چند بار در هفته ☐ هفتگی ☐ دو بار در ماه

☐ ماهیانه ☐ خیلی کم ☐ مطمئن نیستم ☐ هرگز

۴. چقدر احتمال دارد که شما برنج قهوه ای را به خانواده و دوستان خود معرفی و توصیه کنید؟

☐ به احتمال بسیار زیاد ☐ احتمالا ☐ مطمئن نیستم ☐ بعید ☐ بسیار بعید است

۵. آیا شما داوطلب می شوید که یک کیسه نمونه برنج قهوه ای را به خانه خود برده و به مدت یک هفته (۳ بار در هفته) آن را برای خانواده خود بپزید و هفته بعد برگشته و به ما برداشت خود را بگویید؟

☐ بله ☐ مطمئن نیستم ☐ نه

از اینکه برای پر کردن پرسشنامه وقت گذاشتید از شما بسیار سپاسگزارم. نظرات شما با ارزش می باشد و بسیار قدر داریم.



لطفا پرسشنامه زیر را با دقت و صحت کامل کنید، پاسخ های شما محرمانه خواهد بود. در این قسمت ما می خواهیم چند سوال در مورد شما و خانواده شما بپرسیم. لطفا پاسخ خود را با علامت تیک درون مشخص کنید. اگر چیزی از سوال را متوجه نشدید لطفا از ما کمک بخواهید. با سپاس فراوان ☒ مربع از اینکه وقتتان را برای ما گذاشتید.

مکان:

شماره گروه:

شماره داوطلب:

زمان:

تاریخ:

پژوهشگر:

آنجا برانیگان

۱. شما چند سال دارید؟

<input type="checkbox"/>	۱۸- ۲۴	<input type="checkbox"/>	۲۵- ۳۴	<input type="checkbox"/>	۳۵- ۴۴	<input type="checkbox"/>	۴۵-۵۴
<input type="checkbox"/>	۵۵- ۶۴	<input type="checkbox"/>	۶۵- ۷۴	<input type="checkbox"/>	۷۵- ۸۴	<input type="checkbox"/>	۸۵بالای

۱ الف. آیا شما:

<input type="checkbox"/>	بیوه	<input type="checkbox"/>	مطلقه	<input type="checkbox"/>	متاهل	<input type="checkbox"/>	مجرد
--------------------------	------	--------------------------	-------	--------------------------	-------	--------------------------	------

۲. آیا شما بچه دارید؟

<input type="checkbox"/>	بله	<input type="checkbox"/>	نه
--------------------------	-----	--------------------------	----

۲ الف. اگر بله، لطفا تعداد فرزندان را در هر محدوده سنی مشخص کنید. (خالی بگذارید اگر بدون فرزند)

☐ بالای ۱۸ سال     
 ☐ ۱۲ تا ۱۸ سال     
 ☐ ۶ تا ۱۱ سال     
 ☐ ۰ تا ۵ سال

۲. چند نفر در خانه شما زندگی می کنند؟ (شامل خودتان)

۱	۲	۳	۴	۵	۶	+۶	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	بزرگسالان (بیش از ۱۸)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	کودکان (زیر ۱۸)

۳. در چه سطحی از تحصیلات هستید؟

☐ دانشگاهی     
 ☐ پیش دانشگاهی     
 ☐ دبیرستان     
 ☐ راهنمایی     
 ☐ دبستان     
 ☐ بدون تحصیلات

۴. آیا شما شاغل هستید؟

☐ بله     
 ☐ نیمه وقت     
 ☐ تمام وقت

☐ نه، من یک خانه دار هستم     
 ☐ نه، اما به دنبال کار هستم

۵. درآمد ماهانه خانواده شما چقدر است (به تومان)؟

☐ کمتر از ۷۰۰ هزار     
 ☐ بیشتر از ۷۰۰ هزار     
 ☐ بین ۱ تا ۲ میلیون     
 ☐ بین ۳ تا ۵ میلیون

☐ بین ۵ تا ۱۰ میلیون     
 ☐ بیش از ۱۰ میلیون     
 ☐ من نمی دانم

۶. به طور متوسط در هفته چقدر برای غذا پول خرج میکنید؟

هزینه هفتگی برای مواد غذایی:

.....



۶الف. آیا شما برای تامین هزینه مواد غذایی خود با مشکل مواجه هستید؟

☐ هرگز ☐ به ندرت ☐ گاهی اوقات ☐ اوقات ☐ همیشه

۶ب. آیا شما همیشه قادر به پیدا کردن مواد غذایی مورد نیاز خود در فروشگاه هستید؟

☐ هرگز ☐ به ندرت ☐ گاهی اوقات ☐ اوقات ☐ همیشه

۷. چگونه سلامت کلی خود را ارزیابی می کنید؟

☐ عالی ☐ خیلی خوب ☐ خوب ☐ متوسط ☐ بد حال

۷الف. شما مبتلا به کدام یک از بیماری های زیر هستید؟ ( در صورتی که مبتلا به چند بیماری بودید همه موارد را تیک بزنید)

☐ ی استخوان ☐ ورم مفاصل ☐ دیابت ☐ بیماری قلبی ☐ فشار خون بالا  
☐ سرطان ☐ بیماری کبد ☐ بیماری کلیوی ☐ سکنه مغزی ☐ بیماری های تنفسی  
☐ هیچکدام ☐ سایر (توضیح دهید)

.....

۷ب. آیا کسی در خانواده شما (زندگی در همان خانواده) مشکلات سلامتی دارد؟

☐ بله ☐ نه

۷ج. اگر بله مبتلا به کدام یک از بیماری های زیر می باشد؟ (اگر اعضای خانواده سالم هستند نیاز به پاسخگویی نیست)

☐ ی استخوان ☐ ورم مفاصل ☐ دیابت ☐ بیماری قلبی ☐ فشار خون بالا  
☐ سرطان ☐ بیماری کبد ☐ بیماری کلیوی ☐ سکنه مغزی ☐ بیماری های تنفسی  
☐ هیچکدام ☐ سایر (توضیح دهید)

.....

از اینکه برای پر کردن پرسشنامه وقت گذاشتید از شما بسیار سپاسگزارم. نظرات شما با ارزش می باشد و بسیار قدر دانیم.



لطفا پرسشنامه زیر را با دقت و صحت کامل کنید، پاسخ های شما محرمانه خواهد بود. در این قسمت ما می خواهیم چند سوال در باره تجربه شما در مورد پختن و خوردن برنج قهوه ای بپرسیم. لطفا پاسخ خود مشخص کنید. اگر چیزی از سوال را متوجه نشدید لطفا از ما کمک ☒ را با علامت تیک درون مربع بخواهید. با سپاس فراوان از اینکه وقتتان را برای ما گذاشتید.

## Survey Three

شماره داوطلب: شماره گروه: مکان:  
پژوهشگر: تاریخ: زمان:  
آنچلا برانیگان

۱. در طول هفته گذشته شما چند بار برنج قهوه ای پخته و سرو کرده اید؟

☐ ۰ ☐ ۱ ☐ ۲ ☐ ۳ ☐ ۴ ☐ ۵ ☐ ۶ ☐ ۶+

۲. آیا دیگر اعضای خانواده شما از برنج قهوه ای که شما پختید و سرو کردید خوردند؟

☐ بله (همه) ☐ بله (بعضی) ☐ نه

۳. آیا شما در پخت برنج قهوه ای با مشکلی رو به رو شدید؟

☐ نه ☐ کم ☐ بله

..... نظرات؟

.....

.....

۳ الف. به طور کلی، چقدر از نتیجه غذا های مختلف که شما با برنج قهوه ای پختید راضی هستید؟

☐ راضی هستم ☐ تا حدودی راضی هستم ☐ راضی نیستم

..... نظرات؟

.....

.....

۴. در حال حاضر که شما به مدت یک هفته برنج قهوه ای پخته اید، چقدر از این غذا خوشتان آمد؟

☐ خیلی خوشم آمد ☐ کمی خوشم آمد ☐ مطمئن نیستم ☐ کمی خوشم نیامد ☐ اصلا خوشم نیامد

۴ الف. چقدر از طعم برنج قهوه ای که شما پختید خوشتان آمد؟

☐ خیلی خوشم آمد ☐ کمی خوشم آمد ☐ مطمئن نیستم ☐ کمی خوشم نیامد ☐ اصلا خوشم نیامد

۴ ب. چقدر از بافت برنج قهوه ای که شما پختید خوشتان آمد؟

☐ خیلی خوشم آمد ☐ کمی خوشم آمد ☐ مطمئن نیستم ☐ کمی خوشم نیامد ☐ اصلا خوشم نیامد

۴ ج. چقدر از ظاهر برنج قهوه ای که شما پختید خوشتان آمد؟

☐ خیلی خوشم آمد ☐ کمی خوشم آمد ☐ مطمئن نیستم ☐ کمی خوشم نیامد ☐ اصلا خوشم نیامد

۴ د. چقدر از بوی برنج قهوه ای که شما پختید خوشتان آمد؟

☐ خیلی خوشم آمد ☐ کمی خوشم آمد ☐ مطمئن نیستم ☐ کمی خوشم نیامد ☐ اصلا خوشم نیامد

۵. خانواده شما چطور، آیا از برنج قهوه ای که شما پختید و سرو کردید خوششان آمد؟

☐ نظر ها مختلف بود ☐ بستگی به پخت غذای من داشت

☐ بله همه دوست داشتند ☐ بعضی ها تا حدودی دوست داشتند

☐ نه دوست داشتند و نه دوست نداشتند ☐ دوست نداشتند

..... نظرات؟  
.....  
.....

۶. حالا که مزایای پختن برنج قهوه ای را میدانید و به مدت یک هفته آنرا پخته اید و خورده اید آیا امکان دارد خوردن برنج قهوه ای را ادامه دهید ؟

☐ به احتمال بسیار زیاد ☐ احتمالا ☐ مطمئن نیستم ☐ بعید ☐ بسیار بعید است

..... نظرات؟  
.....  
.....

۷. در صورتی که برنج قهوه ای در محل زندگی شما موجود باشد آیا امکان دارد که برنج قهوه ای را برای خانواده خود بخريد و بپزید ؟

☐ به احتمال بسیار زیاد ☐ احتمالا ☐ مطمئن نیستم ☐ بعید ☐ بسیار بعید است

۷الف. هر چند وقت یکبار فکر می کنید برای خانواده خود برنج قهوه ای بپزید؟

- |  |                                      |  |                                  |
|--|--------------------------------------|--|----------------------------------|
| <input type="checkbox"/> دو بار در ماه | <input type="checkbox"/> هفتگی       | <input type="checkbox"/> چند بار در هفته | <input type="checkbox"/> هر روز  |
| <input type="checkbox"/> هرگز          | <input type="checkbox"/> مطمئن نیستم | <input type="checkbox"/> خیلی کم         | <input type="checkbox"/> ماهیانه |

..... نظرات؟  
.....  
.....

۸. چقدر احتمال دارد که خوردن برنج قهوه ای را به خانواده و دوستان توصیه کنید؟

- |   |                               |                                      |                                  |   |
|---|-------------------------------|--------------------------------------|----------------------------------|---|
| <input type="checkbox"/> بسیار بعید است | <input type="checkbox"/> بعید | <input type="checkbox"/> مطمئن نیستم | <input type="checkbox"/> احتمالا | <input type="checkbox"/> به احتمال بسیار زیاد |
|---|-------------------------------|--------------------------------------|----------------------------------|---|

از اینکه وقت خود را برای پر کردن پرسشنامه گذاشتید از شما بسیار سپاسگزارم نظرات شما با ارزش می باشد و بسیار قدر دانیم .

**Appendix 6:** Healthy eating and nutritional and health benefits of brown rice presentation



Slide 1

Why do we eat?



Slide 2



Food provides the body with nutrients  
& energy!'



Slide 3

Our bodies need a constant supply of  
nutrients & energy!



Breakfast

Lunch

Dinner

Slide 4

What are **nutrients**?

Essential substances that your body needs in order to  
grow and stay healthy

Six categories of nutrients:

- ▮ Carbohydrates
- ▮ Proteins
- ▮ Minerals
- ▮ Vitamins
- ▮ Fats
- ▮ Water

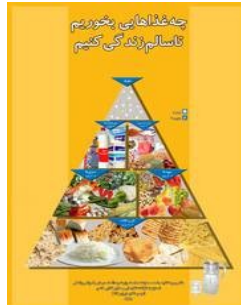
Slide 5

Importance of a healthy diet



Slide 6

Eat a wide variety of foods



Slide 7

Eat more



Whole Grains

Slide 8

Eat more



Fruit & vegetables

Slide 9



## Eat Healthy Fats



Slide 10

## Cut down on



Sugar

Salt

Fat

Slide 11

## Also.....



Processed food!

Slide 12

## Diet related diseases

Dental'disease' **CANCER**

Stroke'

Obesity'

Liver'disease'

**Diabetes** **Heart disease**

KIDNEY  
disease

**Osteoporosis** Hypertension'

**High'cholesterol'**

Slide 13

## Why brown rice?



Slide 14

## Rice Refining



Slide 15

## Brown versus White



Polishing rice leads to substantial nutrient losses

Essential fatty acids Iron Magnesium  
Selenium **FIBRE** Antioxidants  
VITAMINS 'B'1,'3'&'6' Phosphorus  
Manganese

Slide 16

## Health benefits of brown rice

Protects against

Cancer heart disease High in FIBRE  
prevention Gall stones Slow release  
Weight Loss **BROWN rice** SUGAR  
Lowers CHOLESTEROL Reduce risk of inflammation  
Lowers blood pressure **DIABETES**

Slide 17

## So, what next.....

To get the benefits of brown rice

- Try to replace white rice with brown rice three times a week!
- Brown rice works well with many Persian rice dishes!

Slide 18

Lets go see -Dinnertime!

**Appendix 7:** Brown rice recipes given to participants

### دم پخت ماش

**مواد لازم:**

برنج : ۴ پیمانه  
ماش : ۱,۵ پیمانه (ماش پوست کنده یا مَشَر )  
روغن : به مقدار کافی  
نمک : به مقدار کافی  
زرد چوبه: به مقدار کافی  
کنجد آسیاب شده : ۳ قاشق غذا خوری

**روش پخت:**

برنج را به مدت ۳ ساعت خیس می‌دهیم سپس ماش را به همراه زرد چوبه کنجد و نمک به مدت ۱۰ دقیقه در مقداری آب می جوشانیم تا کمی نرم شود. مقداری آب به مواد می افزاییم تا بجوشد سپس برنج خیس خورده را در آب در حال جوش می ریزیم مقدار آب در این زمان باید دو بند انگشت بیشتر از سطح برنج باشد روغن را اضافه کرده و تا خشک شدن آب برنج صبر می کنیم و سپس با کم کردن شعله اجاق برنج را دم می گذاریم.

### کته ساده

**مواد لازم:**

برنج : ۴ پیمانه  
روغن : به مقدار کافی  
نمک : به مقدار کافی

**روش پخت:**

برنج را به مدت ۳ ساعت خیس می‌دهیم. مقداری آب را می جوشانیم سپس برنج را در آب در حال جوش میریزیم مقدار آب در این زمان باید به اندازه یک انگشت بیشتر از سطح برنج باشد همزمان با جوش آمدن برنج روغن و نمک را اضافه می کنیم و تا خشک شدن آب برنج صبر می کنیم سپس با کم کردن شعله اجاق برنج را دم می گذاریم.

## استانبولی

### مواد لازم:

برنج : ۴ پیمانه  
لوبیا سبز خورده شده : ۲ پیمانه  
گوچه فرنگی: ۴ عدد متوسط  
رب گوچه فرنگی : یک قاشق غذا خوری  
پیاز : یک عدد متوسط  
روغن : به مقدار کافی  
نمک : به مقدار کافی  
زرد چوبه: به مقدار کافی  
فلفل : به مقدار کافی

### روش پخت:

برنج را به مدت ۳ ساعت خیس می‌دهیم. پیاز را همراه مقداری روغن تفت می‌دهیم به آن نمک فلفل و زرد چوبه را اضافه می‌کنیم و گوچه های رنده شده را همراه لوبیا سبز به آن می‌افزاییم و ۱۵ دقیقه می‌گذاریم تا پخته شود. مقداری آب روی مواد میریزیم تا جوش آید برنج را اضافه می‌کنیم مقدار آب در این زمان باید یک بند انگشت بیشتر از سطح برنج باشد بعد از خشک شدن آب برنج با شعله کم آن را دم می‌گذاریم.